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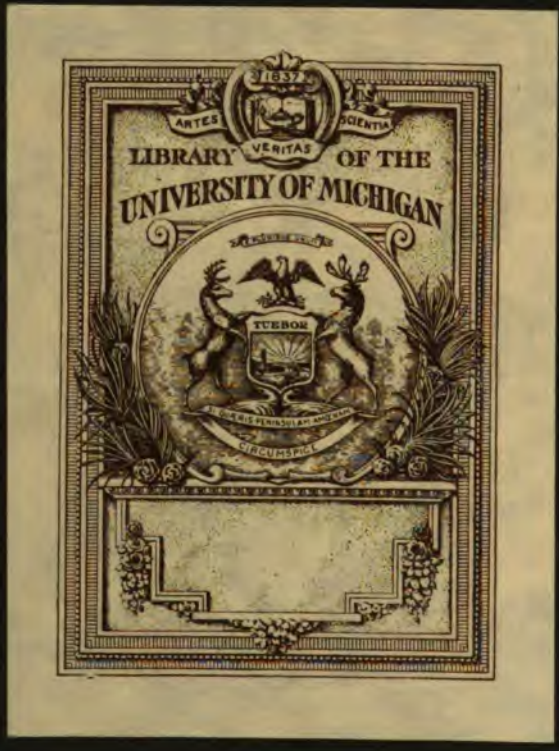
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Unified Accounting Methods for Industrials

by

CLINTON E. WOODS

AUTHOR OF

"Woods' Reports," "Practical Cost Accounting," "Organizing a Factory," Etc.

NEW YORK

THE RONALD PRESS COMPANY

1917

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William G. Hewitt Press, Brooklyn, Printers
J. F. Tapley Co., New York, Binders

DEDICATED
to
MY FELLOW-WORKERS
as an
Instrument to Help Them
Establish the Profession of
INDUSTRIAL ENGINEERING

322006

PREFACE

Somewhere, somehow, sometime, in the universal make-up of things, a relationship will be found to exist between all things that function toward a common end. Activities using the same elements must in some way be dominated by a common principle. If this can be discovered it will serve as a clue to guide the investigator to his goal or enable him to return to the beginning of things for a fresh start if analytical ramifications have led him too far afield. It is with this thought firmly fixed in his mind that the writer has undertaken this work. Its subject matter is not new, but it is treated in a new way to reveal more clearly this condition of relationship.

The scope of this work is limited to industrial or manufacturing activities, although the principles herein set forth are susceptible of a much broader application. It should be borne in mind that this is a day not only of specialists, but also of specialities, and that the cunning of the inventor's mind has lost no opportunity to lighten the burden, lessen the cost, and make more accurate the work of the office as well as that of the factory. Any method of accounting proposed at this time must therefore take full cognizance of this fact if it is to be commensurate with modern progress.

The reader should recognize the fact that it is not to be supposed that any and all industries offer the same opportunities for improvement as those cited in Chapter I of this work, as in nearly all instances the examples used are those where exceptional opportunity existed and was taken advantage of, thereby becoming of educational value as a

foundation for research work on the part of industrial executives who care to study them.

It is to be noted that the forms presented, while selected from those in actual use, are for illustrative purposes, and there is no hard and fast rule preventing their modification or change either in captions, size, or general arrangement to meet any special requirements.

It has been deemed best to present the balance sheet in the first part of the book. This means the giving first of that which would ordinarily be given last; but it is sometimes well to picture a house before building it, and this would seem to be one of those times.

The author realizes the impossibility of writing a book of this character without leaving many questions unanswered, and that it must necessarily be somewhat specific in its subject matter. It has, however, been written for the benefit of three classes of individuals, the executive, the engineer, and the accountant; but in the main, the present work is one of accounting and as such is submitted to his fellow-workers in the industrial world with but one thought and one wish, and that is, that they may derive as much profit from the application of its principles and precepts as the author has had pleasure in formulating them.

In conclusion the author wishes to express his high appreciation of the efficient editorial assistance given by Dr. Carroll W. Doten, of the Massachusetts Institute of Technology, and by the editorial staff of The Ronald Press Company—assistance which has added much to the clearness and general value of the book.

CLINTON E. WOODS

Bridgeport, Conn.,
January 2, 1917.

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Unified Accounting Methods for Industrials

CHAPTER I

THE DEVELOPMENT, ELEMENTS, AND RESULTS OF INDUSTRIAL OR EFFICIENCY ENGINEERING

A statement of facts in connection with the development of accounting and industrial engineering, giving specific instances of the improved conditions brought about in various industries by the application, in their different phases, of one or both of these.

CHAPTER I

THE DEVELOPMENT, ELEMENTS, AND RESULTS OF INDUSTRIAL OR EFFICIENCY ENGINEERING

A New Profession

During the last few years a new profession has been slowly developing in the industrial world, sometimes called industrial engineering, sometimes efficiency engineering, or again production engineering. While this in time promises to be one of the most important of the engineering professions, up to the present moment it has not received the recognition required to clothe it with the dignity of a collegiate degree as in other branches of engineering, and its importance is but dimly recognized by manufacturers in general, owing to the fact that the work of this new profession has been done under many different names, and by a wide diversity of individual effort.

To trace the development of industrial engineering in detail would mean the writing of several books. Therefore, in the present instance, the primary purpose will be an effort to explain its scope, some of the results obtained by its application to industrials, the necessity that exists for such special service as the industrial engineer has to offer, and in so far as possible to establish certain standards for this new profession.

Conditions Which Make Industrial Engineering Necessary

The average manufacturer of today might be called the most magnificent gambler the world has ever known. He

is a buyer, a producer, a seller, and a financier; and in each of these phases of his business he takes a hundred chances where his business brother, the banker, on the one hand, takes none, and the merchant, on the other, perhaps ten.

This relative business worth is reflected in every banker's attitude toward an industrial, for, in making it a loan, he will almost invariably ignore fixed assets or permanent investment and loan on quick assets only to the extent of about fifty cents on the dollar; whereas he will loan a merchant sometimes as high as 70% of his entire inventory and will take the securities of other banks at par.

It might almost be said that banking, the world over, is done today under a unified code of standards, insuring not only safety to the banker and to the depositor, but an earning on investments as well. Merchandising is also conducted under a unified code of standards that minimizes the risk; yet, there are somewhere near 400,000 manufacturing concerns in this country today whose methods of handling the same industrial problems are as diversified as are the things they make and the men who make them, and who, for lack of unified standards to work under, are jeopardizing the interests of both labor and capital—and jeopardizing them to such an extent that it is little wonder that labor forms unions to protect itself, and that capital will buy average industrial stocks or bonds only at a big discount; in other words, on a speculative or gambling basis.

In saying that a manufacturer is taking considerable risks, it is not meant that he does so from choice or that his chance-taking is directly connected with money transactions, but rather that it is due to the nature of the things in which he is obliged to invest his money.

For instance, he gambles with inventions, the development of which is always a pure experiment. Many factories, especially automobile factories, are today filled with

obsolete materials which, sooner or later, must be charged to profit and loss as a result of such experiments.

The manufacturer gambles in buying equipment, which may become obsolete before it shows visible wear, due to the development of more efficient machines for doing the same work.

He gambles every time he employs a new superintendent or foreman, for the man's real knowledge may or may not be to his advantage.

He gambles every time he takes on a new workman, for the man's efficiency as regards quantity and quality of work can only be determined by a try-out.

And so, failing to take into his reckoning all the costs of these uncertainties in his business, he takes a final gamble by meeting his competitor's price, who in turn is doing exactly the same thing, with the result that sooner or later they are both swallowed up by industrial failures.

It is these conditions in the industrial world that have given birth to the new profession called "Industrial or Efficiency Engineering," the purpose of which, broadly speaking, is to provide the manufacturer with a unified code of standards to work under, which will put him on or somewhere near the same basis as the banker and the merchant in chance-taking.

Phases of Industrial Engineering

The development of industrial engineering has thus far been effected not through any educational institution, but by two separate and distinct professions or classes of men: the industrial or factory accountant, sometimes called a systematizer; and the mechanical engineer, sometimes called an efficiency or production engineer. Both are necessary to complete the work of industrial engineering, but neither can do very much alone, for the simple reason that

the function of the former is largely analytical in its nature, dealing only with results as a finality, while that of the other is essentially creative, dealing almost wholly with causes. In other words, the one enables an executive to measure results obtained, while the other sets into activity causes that make possible a predetermination of results. One has worked from the top down by the process of deduction, while the other has worked from the bottom up by devising means for eliminating unnecessary waste; the combined effort of both resulting in a standardization of factory operations.

Therefore, to qualify as an industrial engineer, a man must not only be a master of both of these professions, but also be able to reconcile the necessary workings of one with the other.

Principles of Industrial Engineering

The analytical work that has been done by industrial engineers in the last few years has been something tremendous, and out of it have been developed certain principles that will go a long way toward the required unified code of standards. For instance, in industrial accounting, the following facts have been developed and standardized:

1. That no matter what a concern manufactures, the elements of operation always reduce themselves to the same primes—namely, labor, material, and expense—and are therefore identical in accounting work for any and all manufacturing concerns.

2. That in principle, the accounting of investments and depreciation are the same in every manufacturing business.

3. That in addition to depreciation, two accounts should be maintained—one for obsolete equipment and one for obsolete materials.

4. That to secure uniformity of costs, repairs to fixed assets should no longer be treated as an expense, but charged to depreciation.

5. That labor, material, and expense constitute the units of measure for cost of production. Therefore, the total monthly value of these for any plant must be converted into actual inventoried assets each month.

6. That the commercial transactions of an industrial concern have absolutely nothing to do with production or the costs of production. Therefore, accountants must separate absolutely such expenditures from the operations of a factory.

7. That in addition to the usual accounts of assets and liabilities, there are four analytical accounts—one of profit and loss; one of commercial expense; one of factory overhead; and one of factory production.

8. That through controlling accounts, the wide variables in factory overheads are distributed so as to make the costs of production uniform.

9. That costs divide themselves into two distinct phases: those which pertain to production, or flat costs, and those which pertain to expense which in turn must be absorbed into costs of production. A careful departmental distribution of these expenses is therefore of the utmost importance.

Distribution of Expense

There is nothing that will mislead the management of a concern more than a lump sum prorating of expense over the product made, and a large percentage of industrial failures can be attributed to this cause alone, which too often results in a selling of goods below cost or at no profit, as the following instances well illustrate:

A large concern manufacturing automobile parts and

kindred lines took in a great deal of outside contract work, especially for drop forgings and nickel-platings. They were always successful in getting all of the drop forging contracts they wanted, but were unsuccessful in getting nickel-plating contracts. The general overhead applied to everything in connection with the factory was 125%. In making up their estimates, this was applied to both nickel-plating work and drop forge work; but the real facts of the case were that the general overhead of the drop forge department, as a factory in itself, was about 190%. Using only 125%, they were always low in their bids for drop forge work, and consequently secured plenty of business; while the reverse was the condition in the nickel-plating plant, in which the overhead instead of being 125% was only about 50%. Consequently, in estimating, 125% always made the bids for this department too high, with the result that they could get no business.

This illustration shows the absolute necessity for departmental overheads when outside contracts are taken into the factory to fill-in with in some one department. This particular drop forging department had done work for nothing, or at a loss, for nearly ten years before the fact was discovered.

To cite another case in point, a large furniture manufacturer had for years used a common overhead percentage on his production. As a result, when a thorough analysis of his business was made and a departmental overhead was applied, it was proved that out of over 700 pattern numbers, 154 were being sold at an actual loss and 144 more yielded from none to less than 5% profit, with the result that nearly 40% of the business done every year had been wasted effort. Yet, on the basis of his own figures, which spread the common overhead over both labor and material, everything had previously shown a profit. The first year after

all adjustments were completed, the net profits increased 13½%.

As another instance, a large foundry had always done all its costing on a "per pound" basis. That is, the total expense for labor, material, etc., in the foundry was always divided into the tonnage obtained, and thus reduced to a cost per pound for the entire output. An analysis of the moulding work alone showed that these costs were wholly erroneous. For example, the cost of moulding one pattern weighing 200 pounds was $1.85; while the cost for moulding on another pattern of exactly the same weight was $4. The average of the two pieces would be $2.92 each for moulding, which would be wrong in both instances, as it would be too high for one and too low for the other.

It can readily be seen how such a condition as this would affect estimating on job work, or costs on regular production. To rectify the matter, costing was put on a "per pattern" basis which resulted in a very marked difference in making estimates, and increased the net profits of the concern nearly 9% for the first year.

Unified Accounting

In connection with accounting, all the requirements for an industrial concern have been standardized and unified by means of a set of controlling accounts which give a manufacturer as much detailed information about the operations of his factory and its output as they do about the operations of his sales force or the condition of his finances.

These principles have been so well worked out that they will apply to any manufacturing plant, the only difference being the nomenclature required to classify the details of any particular business, such as (1) the kind of labor, (2) the kind of material, (3) the kind of expense, and, (4) the

kind of output that is manufactured. Any manager who has once learned to interpret figures from an accounting system based on such principles, can apply them to any other business, no matter how different it may be in its nature.

The development and standardization of a unified method of accounting had of necessity to come first, otherwise the engineer would have had no way of measuring the actual value of economies that he might effect. Using such methods his analytical work has been far-reaching, and, as a result, he is today able to predetermine the operating conditions required for many kinds of industrial plants. In doing this, however, he realizes at the outset that in working toward better conditions in any manufacturing business, the real purpose should be to increase production per unit of investment and cost. This is wherein, as an engineer, he differs from the industrial accountant or systematizer, for usually the very first subject he takes up is to determine from the nature of the product made the equipment used, the labor employed, whether or not the plant is yielding all the output it should for the investment made, and, to determine this, he must first standardize the product manufactured as regards kind and variety.

Unified Output

An analysis of present-day factories would show that most of them are making two or three times the variety of items that they should for the volume of their output; that in many instances they are really doing a jobbing business and not a manufacturing business; that they set up, knock down, and set up on machine tools so often in changing from one kind of work to another, that their costs of production are abnormally high, and the workmanship usually poor; that all this results in large waste through spoiled work and an excessive investment in small tools—

to say nothing of the lost time of machines, which in itself greatly reduces the output.

This unscientific policy is usually found in concerns that are dominated by a sales policy rather than a manufacturing one. Investment in a manufacturing business is for the purpose of producing some item or items that will meet with a steady market by virtue of merit and price. This can only be done by a low cost of production. Therefore, the first aim of any manufacturing concern should be to keep its investment busy every minute of the time in order to obtain this low cost, and any concern not doing so is usually dominated by an administration that has not sufficient control of its market or sales force to warrant the investment; in other words, stockholders' interests have not been properly taken care of.

The big money-making plant of today is the one that makes a small variety and a large volume of each thing that it produces. The concern that makes a large variety and a small output of each item is subject to such high costs of production and fluctuation in volume of output per item, that it can never meet the competition of those who manufacture on a scientific basis. Those who manufacture in an unscientific way are merchants rather than manufacturers and use the factory, with all of its investments, as a servant for the sales department.

Function of a Sales Department

Almost any business manufacturing on a proper basis and making good dividends, simply uses the sales department as a servant to its investment, and does not allow it in any way to interfere with manufacturing operations after designs are once accepted by it. The management of such a factory standardizes its product, schedules it to the extent that will keep the investment and labor busy, and then de-

mands of the sales department that it shall sell the specified output in its standard form. There is usually no difficulty in doing this, as such a manufacturing policy always brings high quality and low costs—the only two things in the world that can win every time in competition, provided always, of course, that in design and utility the product made is up to some recognized standard. Salesmen and sales managers are only human, and work along the lines of least resistance, usually with the idea that the larger the variety of items they have to sell, the better they can control the market and make sales. This may be true from their point of view, but when variety reaches a point where it so increases cost as to rob sales of all profit, the policy is fatal. Therefore, standardization of the product is the engineer's first problem. The result of correcting such conditions is well illustrated by the following examples.

Results of a Unified Output

In one instance a variety of 89 items of manufacture was made. The annual net profits of the business averaged 5½%. A careful analysis brought out the fact that the sales on many items were so small as to make them profitless. In some instances they were made at a loss, due to high costs of production, because of the small quantity made. The variety was reduced from 89 to 56 profitable items. The factory was put on a schedule basis of fairly long runs for each different piece manufactured. By this means, the cost of production was so greatly reduced that, notwithstanding a considerable reduction in sales price, which increased the volume of sales nearly 50%, a net profit of 14½% was realized the year following.

Another instance along these same lines was one connected with the manufacture of units of very small value, viz.: buttons. The concern in question manufactured about

a thousand varieties. The introduction of an analytical cost system revealed the fact that out of the thousand kinds nearly 600 kinds were sold at absolutely no profit or at a loss. The total volume of business was in the neighborhood of $400,000 a year. The concern paid small dividends, but could have paid the same dividend on an output of less than $200,000. Improved methods of manufacture recovered a profit on a little over 300 of the kinds that had previously been profitless, and the manufacture of the other kinds was abandoned. Result—a 10% dividend instead of 2½%.

Another instance and one of considerable interest, was in connection with a concern manufacturing bicycles and kindred lines. The first complaint the manager made was that his order department was continually in a mess and he wanted that straightened out first. A thorough investigation revealed the fact that (as is the custom in such a business) he gave a large number of options in the shape of tires, pedals, saddles, handle-bars, etc., on each model of bicycle that he made, with the result that on one individual model of bicycle 414 separate and distinct purchase orders could be made. As he manufactured several models, it is little wonder that his order department was in a continual state of confusion. The remedy was to cut out the options as far as possible and to standardize the entire line. By doing this his inventory on materials was reduced 27%, and for the first time in seven years the concern paid a dividend.

Stabilizing Production

Another cause for many industrial disasters is that many merchant managers run their factories altogether too much according to varying sales conditions, increasing and decreasing their output and the amount of labor employed

accordingly. On this account their investments are idle a great deal of the time, simply showing that plant investments have been made out of proportion to the market under control. More money could be made by cutting selling prices and keeping the investment and labor busy, because the difference in cost of production would make this possible.

An instance which brings out the above facts very forcibly was a concern which manufactured lamps of a certain kind as one department of its business. This department had lost the company $25,000 the previous year and they were about to abandon it. Before doing so, however, they called in an industrial engineer to discover, if possible, what was wrong.

A careful investigation of the lamp department showed that the costs were abnormally high because the lamps were made up on order, that is, as they secured one contract after another. The quantities put through the factory varied, being sometimes very small and sometimes quite large. The engineer decided that, unless the volume of business could be increased about fourfold, it would be necessary for them to abandon the manufacture of lamps.

With this information in hand, he studied out just what the costs ought to be, provided such a volume of business could be put through the factory on a schedule basis. His report to the manufacturers stated that they ought to save about 16% on the cost of production, and that by virtue of this reduction, they could cut their sales price 10% or 12%. Such a cut would undoubtedly increase their sales up to the required amount.

After due consideration, the concern agreed to the suggestions of the engineer, and instructed him to take hold of the proposition from a manufacturing point of view. This he did, and as an actual result made a reduction in costs of 18%, while sales increased something over threefold, and a

profit of over $8,000 was produced in the lamp department the first year.

This same condition often exists where a concern makes for its own use items that are a standard in the open market. Their quantity requirements are often too small and the variety too great for economical production.

For example, in a medium-sized concern that made freight cars, they had always made their own bolts. As they never had any cost system, they supposed, of course, they could make their own bolts much cheaper than they could buy them. A careful working out of costs showed that it was costing 13% more to make their bolts than to buy them, notwithstanding the fact that they had good machinery for bolt-making. The reason was easily ascertained. The quantity was too small and the variety too great, and they changed so often on the machines that these latter were idle half the time. They never ran through more than 4,000 or 5,000 bolts at a time; and it was found that they would have to run through at least 25,000 bolts at a time in order to make them at a cost equal to that for which they could be bought.

As a result of this careful study, the management obtained outside contracts sufficient to give them the quantity of production needed to produce their own bolts cheaply.

Standardizing Output

All of the foregoing instances simply illustrate the process of trimming down variety; or, in other words, a standardizing of the things to be sold. The real standardization of production comes in studying the possibilities for using as many of the same pieces or parts on different models or units as possible, and a careful analysis of the operations, equipment, and labor required for producing these.

In one instance a builder of houses designed the pieces and parts for a roof so cleverly that eighteen distinctly different roof models could be built from the same cuttings.

In a large concern manufacturing harvesting machines, the inventories of raw material were reduced nearly a third by an analysis of this kind, which revealed the fact that there was not enough difference in many of the flat, round, and angle irons used on the various models made to affect them mechanically. This also applied to bolts, screws, rivets, and many small castings. Standardizing these parts not only resulted in reducing the inventory, but gave much larger runs in each set-up of a machine, producing marked economies in this way.

In an automobile plant making three sizes of motors and eleven automobile models, a standardization of parts resulted in effecting an interchangeability of individual pieces to such an extent that 1,160 were discontinued. This not only greatly reduced raw material and repair parts inventories, but greatly increased the factory output and eliminated many of the shortage troubles. This, like the harvesting machine concern, was simply a case where the engineering department and the manufacturing department had worked on independent lines. Designers are not always manufacturers, and as a consequence do not always take possibilities of this kind into account.

Well-Balanced Equipment

After an analysis of this kind, the industrial engineer takes up the study of operations to be done on the different pieces and parts made and the equipment available for doing the work, both as regards quality and quantity; and right here is where he runs across some very difficult problems to solve.

If it were possible to get a total of idle time, and conse-

quently investment in unused tools and equipment, it would be startling. The principal cause for this condition is that, in many lines of manufacture, various departments and the equipment of same are not so balanced with other departments as to produce a uniform output. An examination of almost any factory would reveal the fact that many machines are idle from half to two-thirds of the time, while other machines are not of sufficient capacity to meet the demands made on them, even by running them overtime.

To illustrate this point more fully, an actual instance may be cited:

A certain plant had a total investment of about $800,000, yielding an average annual output of about $900,000. In this plant, some of the departments and machine tools during certain portions of the year ran overtime and night shifts, while others had scarcely enough to keep them busy nine hours a day and many were not used an average of three days a week.

Fortunately, this company had plenty of opportunity to expand its market, as it made only about 6% of the total market requirements in its particular line. Therefore, the expert went to work to find out what should be done to balance up the output and the equipment in the plant. A careful analysis, by operations, of the product manufactured, and, a detailed study of what could be done upon each machine, together with its capacity for doing the work required, showed that the factory turned out its annual output by running some machines eighteen months on a ten-hour basis; while others were required but four or five months on the same basis.

Under these conditions, the problem was to shift the work around on different machine tools, to find out just what machinery should be bought so as to balance up the output, to keep all of the machine tools busy all of the time,

and to ascertain what output could thus be obtained. This took the time of a number of men for several weeks, but the results obtained warranted the expenditure many times over. It was found that it required exactly $69,000 worth of added machinery to balance up the plant for a uniform output in all departments; and that by purchasing this machinery, the output could be increased from $900,000 to $1,500,000 per annum.

This factory gives an instance where a $69,000 increase on an $800,000 investment produced an output 66% greater than was already being produced. After this investment was made, all overtime and night shift work was abolished. Looked at from another point of view, on a $900,000 output, the business was overinvested in by at least $275,000; and overinvestment is a condition in hundreds of plants today.

Standardization of Labor

Next, and perhaps most important of all, comes the standardization of labor and its application to equipment usage—an analytical work that is usually done under the name of "scientific management."

In most factories, both foremen and men do work after a fashion of their own, according to their individual experience and judgment, both of which vary greatly with different men. Consequently, there is no standard by which different men shall do the same kind of work so as to produce the same results.

As men leave a factory, one by one, and others take their place, methods of doing the work vary accordingly. To what extent these changes take place may be readily understood by the statement that, in many lines of manufacture, the change in men or "labor turnover," is equal to the entire force annually. There are some automobile concerns where it equals two and one-half times the average working force.

Consequently, the same work is subject to many different methods of handling in the course of a year, with the result that both the volume of output and the costs vary greatly, as does also the quality of the work done.

The interchangeability of parts on American-made machinery is a well-known feature and has been brought about by a standardization of the various products made. Scientific management is now endeavoring to do exactly the same thing with labor. That is, it is determining methods which will standardize the way in which work shall be done, irrespective of foremen's or men's experience, so that no matter how much the labor factor may change in a factory, the work will always be done in exactly the same way, with the same accuracy, and with practically the same speed. The greatest obstacle to this work today is the instability of labor in general; there is little use in taking a force of workmen through a course of motion study training if they are to leave by the time or before they get through the course. The first step is to insure (by establishing an incentive of some kind) a stability that will warrant the proposed education in efficiency.

Adjustment of Labor and Equipment

"Equipment" must also be considered in this connection. If observations are taken on twelve different men, operating exactly the same machine, on the same work, in the same or different factories, a surprising difference will be found as regards both the quality and the quantity of work done. To standardize it, the possibilities of the machine and its accessories, in the shape of tools, etc., as well as the operator who runs it, must be studied. That is, the physical motions of the man in handling the work and the machine, as well as the performance of the machine itself in doing the work must be carefully analyzed and synchronized. This only

applies to the individual machine. Attention has already been called to the grouping of machines and the balancing of the equipment.

Results of Scientific Management

In concluding this introductory statement which is intended to give an understanding of the principles of scientific management and of what the work really means, a brief review of some actual results obtained by its application may be interesting.

In a plant where steam-heating apparatus was manufactured, a man had worked for years turning a certain piece on a particular machine. He had always been paid by the day, was considered a good man, and everyone was satisfied until an exponent of scientific management entered the shop to study its operations.

Among many other operating details the work of this man received attention and the man, the work, and the machine were carefully analyzed. The man had been receiving $2 a day, and he turned out an average of ten pieces a day. In other words, it cost the company 20 cents a piece for labor on his work. The expert insisted that a great deal more could be obtained from the man and the machine. The superintendent did not believe it, but was willing to try out the suggestion offered. The expert told the superintendent that the work was worth about 10 cents a piece. The man was offered 10 cents a piece, on a piecework basis, and was ready to quit his job, but the superintendent prevailed upon him to try it.

To give the workman every chance to succeed, his work was laid out in a scientific manner, he was told just how to handle and place his work in the machine, the exact speed the work was to be run at, the cut that was to be taken in the metal by the cutting tool, etc., etc., and on the last day

of the third week of trial, he turned out thirty pieces, making $3 for himself instead of $2, and the work cost his employer only 10 cents a piece instead of 20 cents. The man had literally been robbing both himself and his employers for years without either one of them being aware of it, which is a condition that exists in thousands of factories today.

In another instance, there was to be made in a factory a certain part of a new gasolene engine. Both the superintendent and the foreman of the department were called in by the expert and asked what they thought would be a good record day's work for a man on that particular piece. Both of these men were old employees and had a thorough knowledge of the machine on which the work was to be done and of the man who was to operate it. After due consideration, their answer was, that 350 a day was the absolute limit.

In the meantime, the expert had studied out his own method of handling this particular piece in processing it, the speed it could be run at, the changes in the shape of cutting tools that were necessary to remove a given amount of metal in a given time, what cuts should be taken first, and just how the work and the machine should be handled in every detail. Having this knowledge at hand, he immediately told the superintendent and the foreman that 600 was to be the limit he would set on the piece. They said emphatically that it was impossible, but at the end of the seventh day the workman turned out 660 pieces as his work for that day, earning a bonus of 10%.

Broader Applications of Scientific Management

These two instances illustrate only individual and simple cases. It will be of interest to see how this sort of management has worked out in a broader application.

A certain manufacturer had about $300,000 invested in equipment. His factory was better than the average, and so

were his foremen and men. An increasing demand for his output brought him to the point where it seemed necessary to spend at least another $100,000 for equipment. His factory, however, was located in a large city, every inch of floor space that he had was occupied, and there was no opportunity for him to purchase adjacent property for expansion. So, a move was staring him in the face.

The manufacturer in this case knew little or nothing of scientific management, for always having had a good money-making business, he had never interested himself in such questions. However, the problem was a difficult one and he employed an expert to go into his factory. The result of the expert's recommendations was an increase of 33% in the output of the factory in a period of six months. In many instances the work of individual tools was doubled. On some it was increased 25% to 30%. The expert not only saved his client the $100,000 investment, but also the labor, power and expense that would have been required to run the addition to the factory afterward. In fact, he increased the efficiency and output of the existing equipment and labor to such an extent as more than to double the actual net profits of the business.

In the three cases cited on the foregoing pages, there was unusual opportunity to apply the principles of scientific management. Experience has shown that some kinds of business are much more suited to these labor refinements than are others, and that the degree to which they can be carried depends in large measure on the nature of the business. It is also true that the degree of efficiency to which labor may be developed depends, in large measure, upon the stability of the labor, as well as upon the kind of output manufactured. For example, a certain concern employed 2,200 shop hands regularly; yet, during twelve months they laid off 5,380 hands. Such instability of labor

as this makes the ultra refinements of scientific management simply out of the question.

In conclusion, one more instance may be cited to show the economies obtained through putting a factory and a sales department on a schedule basis:

A concern manufacturing furniture handled its business as do all such concerns, by manufacturing according to varying stock conditions. That is to say, whenever a pattern number ran low, a cutting order was put in for some quantity, according to the superintendent's or manager's judgment. Each pattern was finished up to a certain point, and then put into a warehouse until shipped, at which time the final finish was made. This resulted in three undesirable conditions:

1. A large warehouse inventory.
2. A large repair expense to stock.
3. A large loss on "close outs" semiannually, because the cuttings were often greatly in excess of sales, and new patterns would push older ones out of the market.

To correct these conditions, the line was reduced in variety by cutting out the small sellers; the sales department was required to go over its sales records on the remaining patterns, and from them prepare a statement of the quantity it would agree to sell of each pattern each month for the next twelve months; and the factory was scheduled to produce each month the sales department's estimate of sales.

As a result of these changes, 75% of the total output went right to the shipping room instead of to the warehouse; the inventory was reduced $55,000; $20,000 repair work to stock was reduced to $4,000, and the semiannual "close outs" were entirely eliminated. The whole plan amounted to a saving of about $24,500 a year and a withdrawal of

$55,000 from investment. Furthermore, the value of the output was increased 23%, with the same pay-roll and equipment, by properly organizing the factory to handle work on the new lines.

Many other instances could be cited, but those given will suffice to show how the industrial engineer is developing his profession, and, in a measure, to what extent he has already obtained results. He is not merely a systematizer. He is not simply an accountant. To him, these things are only a means to an end. He analyzes, standardizes, organizes, and unifies the workings of an industry in its entirety, in his effort to obtain maximum production at minimum cost and with minimum investment. He might well be called "an industrial pilot to captains of industry."

CHAPTER II

ANALYZING AN INDUSTRIAL MANAGER'S MONTHLY BALANCE SHEET

An analytical treatment, demonstrating by figures what *Unified Accounting* does and its value as a controlling medium in connection with finances, inventories, investments, sales, purchases, expenses, overheads, production and organization, together with the relation of these to one another.

CHAPTER II

ANALYZING AN INDUSTRIAL MANAGER'S MONTHLY BALANCE SHEET

The Work of a Manager

An industrial manager, in undertaking to accomplish certain results, should shape his organization to that end, assign the work to be done to the various department heads, and then, himself, supervise their handling of detail. That is the whole story in a nutshell, as to what the work of a manager ought to be.

But a manager may have all the intellectual power imaginable, and yet, lacking the absolute facts with which to supervise his work, he is likely to become the slave of his organization, instead of its master. His departments will run him, instead of being run by him. The ship will have twenty captains, instead of one, and it will be impossible for him to steer a definite course to success.

To supervise intelligently, he must have facts—*absolute facts*—concerning the operations of his business, at all points. *Verbal* information is unreliable and always incomplete. Special reports are frequently misleading. If he depends upon this kind of information to guide him in his supervision, he is at the mercy of various department heads, and must not only sacrifice most of his prestige, but will fail in producing many possible economies, and will usually pile up inventories instead of dividends.

To direct with certainty, he must be able to judge the

work of others not by intentions, promises, and excuses, but by cold, hard facts, as shown by some comprehensive method of measuring the results obtained by those to whom he has assigned the work.

Purposes of Unified Methods of Accounting

The unified methods of accounting which are here presented are intended to furnish an accurate instrument for measuring results, in the form of a detailed accounting system fitted to every element in a business, and governed by a set of controlling accounts. The installation and operation of such a system is usually no more expensive than the fragmentary systems used in most factories today; yet the resulting benefits will easily be recognized by any manufacturer who will carefully study and apply the principles discussed.

There have been many different accounting systems constructed for manufacturing concerns, some of which are so elaborate and expensive as to be burdensome and top heavy, simply because they compile regularly much information that is never used by anyone. By these unified methods, however, it is often possible to trim them down to a practical system of accounting without sacrificing the good they may have accomplished and without destroying the comparability of the data.

What is required of any accounting system is certain, definite information, every bit of which is usable and used, which is founded on basic principles, and all of which is so unified that every fact it presents is related to a common whole.

The Monthly Balance Sheet

Any manager who is giving serious thought to the success of his business desires first of all to know those

factors which control not only the business, but the personnel of his organization as well. Nothing will give him this as well as an analytical monthly balance sheet.

The manager of any large manufacturing concern should no more undertake to run his business without a statistical monthly balance sheet, than should a superintendent undertake to make an automobile without detail drawings.

The balance sheets of many manufacturing concerns appertain to little more than commercial transactions. Usually, where a cost system has been developed, bookkeeping is one thing, cost accounting is another, while production is treated as an incident in so far as accounting is concerned, and often anything like accurate information about the business as a whole is obtained but once a year.

The author has devoted much time and study to perfect a unified method of accounting for industrials which should be to the manager of a manufacturing concern what detail drawings are to a superintendent, i.e., something definite to work from, and he takes pleasure in presenting the results of his labor in the form of a complete set of balance sheets (Form 1) worked out in detail, showing an entirely new arrangement of accounting, as obtained by unified methods, especially as regards factory operations and production. These sheets represent a unification of all cost accounting, bookkeeping, and general accounting into one set of controlling accounts, and give in addition the complete inventories of production as well as the costs of production.

In other words, if a factory purchases so much material, labor, and expense each month, the accounting system must render an inventoried balance of these items, and this in turn must be balanced with the controlling accounts. By controlling accounts is meant a set of accounts that will give certain balances in connection with a business entirely independent of accounts as carried in current ledgers; in other

words, the balances which constitute controlling accounts are obtained from one source and compared against corresponding amounts from the routine accounting work of various departments. In this way, an absolute check on the accounting work is obtained, as well as a control over the various activities of the organization.

These balance sheets should be completed and in a manager's hands not later than the eighth of each month for the month previous. During the month a "General Manager's Daily Digest" is used, which furnishes information on sales, shipments, finances, purchases, labor, and schedules in such a way that these balance sheets in part are a monthly summary of the items appearing on the "Daily Digest" sheet. (See Form 2.)

These balance sheets show in detail not only what has taken place in the business for the month, but also gives comparisons from the month previous and cumulative statistics down to date for the year. They also show comparisons of the present year with the year previous on the same dates. Further, the classification and statistical comparison as a whole are such as will not only give any manager an opportunity to take immediate action in planning for the future, but at the same time will give him control of the organization under his charge, as will be shown in the general analysis.

In analyzing the balance sheets shown in Form 1 as they should be analyzed by the manager of the company, it is necessary to study them from three different points of view; first, from that of the financier; second, from that of the executive; and third, from that of the manufacturer.

Analyzing the Balance Sheet—From the Standpoint of the Financier

Under this caption there are four prime factors of successful operation to be considered:

1. The solvency of the company, determined by a comparison of its assets with its liabilities, giving due consideration to the character of same.
2. Its earning capacity, determined by comparing its total sales against gross and net profits.
3. Its earnings as compared with the investments made.
4. The handling of the business as a whole.

It will be noted in the balance sheet shown in Form 1,* that current assets total $197,924.10; that the inventory of materials and merchandise amounts to $283,563.70. This is as far as the financier can go, because these two totals constitute all of the quick assets, which amount to $481,-487.80. Against this there are total current liabilities of $170,685.78. In other words, there is $310,802.02 more in quick assets than there is in current liabilities. A business of this nature would be entitled to carry liabilities to the extent of at least one-half of its total quick assets; therefore, there is still a borrowing capacity of not less than $70,000.

The profit and loss account shows that there was a net profit of $14,955.63 for January, 1917, and that the net profits for eight months have been $72,855 which, on the total volume of sales for eight months ($785,804.75), equals 9.2%. Therefore, the business as a going concern is in a very healthy condition, especially in view of the fact that the net increase in sales for the current month has been $42,745.14.

The total assets, including investment in the business, are $859,643.16. The net profits for eight months having been $72,855, the business is paying at the rate of about 13% per annum on the investments, which is very satisfactory.

*As a matter of convenience, many of the amounts in this discussion have been given in round numbers.

Conservatism is shown in the management of the business by the fact that depreciation is charged into costs monthly, and that accrued dividends on preferred stock are not carried in Profit and Loss Account, General; so that, after deducting dividends on preferred stock, the $63,532.72 earnings in eight months are free to be applied as a dividend on common stock and for surplus, according to the decision of the directors.

Accounts receivable have increased only $20,000 on an increased sale of $42,000, which indicates a healthy cash market. Again, current assets have increased by over $13,000, while current liabilities have decreased by $6,000. Accounts payable have increased only $12,000 as against an increase of $23,000 in general stores, all of which goes to show a strong tendency to discount purchases.

That finances are being well handled is evidenced by the fact that for the eight months cash discounts and interest received have amounted to $14,196.60; furthermore, the expense in the office, covering all accounting work, has amounted to but $21,098.63 for the same period of time. In other words, the accounting department has earned about 66⅔% of its own expense, or 22% of the entire general commercial expense; therefore, to a banker, the entire condition of the business would be most satisfactory in every way, and one in which there would be no question concerning a loan of $70,000 or $100,000 if for any reason it were required; and if the present volume of sales were to keep up, an increased investment, either of a temporary or permanent kind, would probably soon become necessary.

Analyzing the Balance Sheet—From the Standpoint of the Executive

When a manager creates an organization around him, he should not, as is too often the case, assume the responsi-

bilities of his various department heads, or do their work for them, but should throw the whole responsibility on them and then judge them altogether by results. If the results are not satisfactory, he should immediately make changes in his organization and get men big enough for the positions. To be able to work on these lines he must have a set of controlling accounts that control not only the finances and investments of his business, but his organization as well. What is meant by this is illustrated in the following brief analysis:

The manager would first check up the cashier's department by asking for the bank balances at the terminating period of the balance sheets. If they check with cash on hand of $25,070.20, all is well.

He would then ask the billing department for the balance of accounts receivable as shown on the customers ledger, which must check the controlling account of $120,172.80. If their balances agree, their work is correct. If not, they are in error and they must locate the discrepancy.

The bookkeeping department is then called upon for the current accounts payable, which must check the controlling account of $109,627.68. If it does not, they are again in error and must locate the discrepancy.

Next, the same inquiry applies to general stores inventory. The stores ledgers must check the controlling account of $112,490, and so on for all important accounts constituting liabilities and assets as shown on the balance sheets.

After the heads of these particular departments have been found in error two or three times by a manager, the moral influence that these controlling accounts have over them is far-reaching, as it not only compels them to do their work right, but keeps them from defalcation of any kind. This in itself is worth many times what it costs to get

information in this form, as it in a way really constitutes a self-auditing system.

Reviewing further, as an executive, the work of the organization as revealed by the balance sheet, the next consideration is the collection department. From this must be obtained an explanation as to why accounts receivable past due have been allowed to increase $7,314 or a little over 50%, as shown on the balance sheet; and also why notes receivable have been allowed to increase $512.25. In the collection of these accounts, however, it is to be observed that accounts receivable, consigned, have decreased over $7,000. This, however, reflects a credit on the sales department rather than the collection department.

At first glance the condition in the purchasing department is not altogether satisfactory, inasmuch as general stores have increased $23,000, while factory production has had a slight decrease in its use of general stores. This requires information from the stores department as to what the items are that have caused an increase of 25% in the general stores inventory, and an explanation from the purchasing agent. Nominally, the general stores inventory should not be over 60 days' factory requirements, as most materials can be obtained in less time than this from the market. The production sheet shows that $45,000 worth of general stores were used for the month, which would make a maximum inventory of $90,000; whereas the inventory is seen to be $112,490, or $22,490 too much. The decrease in inventory on work in progress, semi-finished stores, and finished stores, will be taken up from another point of view.

From investment under assets, it appears that betterments have taken place this month to the extent of $5,442.90. Further, the factory production sheet shows that betterments have been made for the eight months to the extent

of $22,780. From a knowledge of factory conditions, this seems excessive for the current month. Therefore, the office manager must give an explanation as to why it has been necessary to expend $1,100 for office furniture and fittings during the current month, which is apparently an excessive amount. Next, the superintendent is asked for an explanation as to why it has been necessary to spend $4,342.90 for machinery and tools, dies and jigs, etc., during the current month.

While it is true that both the office manager and the superintendent have an absolutely free hand in making expenditures, it is also true that they are answerable for exactly what they do every thirty days, and after men have been under such management as this for a few months, they think out their problems with a great deal of care before they make purchases of any character.

From the profit and loss sheet analysis, the sales department is to be complimented, inasmuch as its net sales have increased $42,745.14 for the month; especially is this so after looking at the analysis of commercial expense, for while sales have increased 42%, selling expense has only increased 14% over the previous month. There is one thing, however, to see the sales manager about immediately, and that is the fact that sales have increased $34,762, or 400%, on one model, while they have been reduced by over $20,000 on another, which is evidence that one model of machine is taking the place of another in the market. If this is so, manufacturing conditions must be immediately adjusted accordingly; therefore, a complete explanation of the means which have been adopted to increase the sales on this particular model is demanded. This will probably enable the manager to judge whether it is a permanent or temporary increase and whether it is local or general in its territorial expansion.

The whole commercial analysis of the business, with some few exceptions, shows it to be fairly satisfactory from an executive point of view, especially in view of the small net increase of $1,257.50 on total commercial expense as compared with the total increase in sales. The only other point in this connection would be to take up with the advertising manager the total monthly advertising of $4,168.90, which could possibly be reduced for a while, in view of the increased sales.

The average yearly percentage of commercial expense to sales is 15%. Therefore, 12.1% is extremely satisfactory and shows that this percentage has been reduced during the current month by 4.3% over the previous month.

Analyzing the Balance Sheet—From the Standpoint of the Manufacturer

There are very few manufacturers today who know what production they ought to get from their factories, what they are getting, or in what shape they are getting it. In other words, they have no definite control over the operations of the most important thing they have to deal with, i.e., their investment in plant, material, and labor. This is what a unified accounting system provides for, so in the present instance there is a long session to be held with the superintendent.

The total production for the month is $110,800.57, or $939.37 less than it was the previous month, notwithstanding the fact that productive labor has been increased by $3,218, as shown on the factory production sheet, and overhead, by $2,101.85, as shown by the increased non-productive labor ($1,610) and non-productive materials ($491.85) on the factory overhead sheet.

The decrease of $290 in general stores and of $6,441 in semi-finished stores would seem to show that the produc-

tion for the month has been obtained by an abnormal increase in labor on the work. By analyzing a little further, it will be seen that while the factory used $27,221 in semi-finished stores, it only delivered back to semi-finished stores $21,200, and that out of the total production $5,442 was charged to betterments.

The net increase in total production, finished, however, was $16,188. This could only have been obtained, in this case, by reducing a previous inventory which had already had much labor applied to it, inasmuch as the previous work in progress was $64,000, while the net work in progress for the current month is only $47,000. "Assets—Inventory" shows that work in progress was reduced $17,127.55, semi-finished stores $13,021.25, and finished stores $1,814.38; or a total of $31,963.18, which is exactly the amount necessary to make the increased sales of $42,745, the cost of which is shown to be $31,963.18.

This means that while the factory has delivered enough to meet sales requirements for the current month, it has drawn down inventories on work previously done to the extent of over $31,000, and consequently is that much behind sales in its production for the month. Therefore, for the coming month under present sales conditions, the factory would fall behind in its deliveries by something like $50,000, except for the fact that, as shown under assets, there is $47,000 work in progress, $67,000 worth of semi-finished stores, and $56,000 of finished stores to draw upon.

It will not do, however, to reduce these inventories, as they are not even normal as it is. $56,000 represents only about 12 days' shipping requirements, while the inventory ought never to be less than 30 days' requirements. Semi-finished stores of $67,000 represent only a production of a little over 60 days, as during the current month $27,000 was used in the factory and $7,000 was sold in parts, while

work in progress is low by about $17,000; therefore, the condition of the whole factory has to be keyed up, as the inventories are all out of balance in their relation to one another.

To do this, the factory must be re-scheduled; more labor must be put into the departments of first operation; and next month's balance sheet ought to show an increase in the use of general stores of at least $20,000 or $25,000, in order to get work coming through the factory fast enough. Therefore, in view of this situation, it is fortunate that general stores inventory has been increased during the present month by $23,000.

The factory overhead for the month shows 80.27%, which is a reduction of 1.52% for the month previous; and so far as this goes, it is very satisfactory. There are also a large number of similar details in connection with this balance sheet that could be analyzed, such as the percentage of profits on the different items sold, the percentage relation between depreciation and repairs, the various ratios between non-productive and productive elements, etc., etc.

Availability and Value of Unified Balance Sheet

It should be explained that both in principle and detail these unified methods of accounting can be applied to any kind of manufacturing business, according to its own particular requirements. No matter what a concern manufactures, it can only use labor, material, and expense as processing factors, and can only buy and sell as commercial factors; and the principles laid down apply. If necessary, inventories can always be divided up into more or less numerous accounts; as can also labor and material or expense of any kind; in other words, we can take the prime totals of assets, such as current, inventory, and investment, and divide them up into any classification that may be re-

quired. The same may be said of liabilities, also revenue and costs of revenue, and so on for the other various divisions that have totals.

The value of these balance sheets is also greatly increased where data from the previous year are filled in, as provided for in the last column, for a comparison of contractions or expansions in volume can then be made on a long range basis. Sufficient has been said to show the purpose of these accounting methods, their scope, and also their value to any executive who wants to manage a business on anything like a scientific basis and keep right up to the minute in his work.

If any manufacturer will give the time to analyze his own business in the manner indicated, it will not take him long to determine the invaluable assistance such accounting methods can afford him; and the feeling of security he would have in handling his business by reason of being in absolute control of it, justifies many times over the expense and trouble incident to their installation.

Manager's Daily Report

Nothing is of more value to a manager than a daily report showing the relative value of sales and shipments, and in addition, finances, bank balances, and such other general information regarding agencies, number of employees, etc., as may be necessary to him. Such a report is given in Form 2, which will at least offer a suggestion to any manager for developing a report of this character for any particular business.

The arrangement of the items under sales and shipments should be made to correspond practically with the same items as shown on the monthly balance sheet, which in reality are a recapitulation of a general sales analysis made at the end of the month.

Further information can be supplied on this report, such as any outstanding obligations in the shape of purchase orders, together with such data as "purchases made" of different commodities each day. Other items will suggest themselves to any manager according to his needs for information.

CHAPTER III

PURCHASING AND RECEIVING

A method for making purchases and following them up—the recording and checking of all such transactions, and the receiving and checking of the goods purchased.

CHAPTER III

PURCHASING AND RECEIVING

Work of the Purchasing Department

While this chapter confines itself principally to the specifications and forms required to make purchases, reference is made in several instances to a stores keeper and stores recorder, simply to show the relation between the purchasing agent and stores, and to evidence the fact that any organization must be so worked out that the general stores keeper may be responsible solely to the purchasing department:

1. For the receiving and checking of all materials against original purchase orders, in such manner that all purchases can be checked before being recorded on stores ledgers.
2. For the physical storage of materials and the delivery of same to the factory at either the storerooms or the factory departments, as may best conform to the factory requirements.

Purchase Specifications

To make intelligent and satisfactory purchases, a purchasing department should be guided and directed in every instance by specifications, as to both quantity and quality, for everything that is to be bought. Therefore, it is pertinent to take up at this point the following facts:

If a schedule for the making of goods to be sold has

been authorized, it should carry with it authorization to purchase the material, labor, and expense necessary for its completion.

If a betterment or repair order has been authorized, the same rule applies; and if office, operating, and factory supplies have been covered by a maximum and minimum amount for stores, this should be a standing authorization for purchase up to the maximum amounts. In this way the manager is relieved from the tremendous amount of detail incident to passing on every requisition for purchase. Therefore, a production department should prepare and furnish to the purchasing department detailed specifications as to quantity and quality of material required for goods to be manufactured for sale.

On all betterment and repair orders which have been O K'd by a manager, whether for the benefit of the production department, factory superintendent, or any other department head, specifications for quantity and quality of material should be furnished by the originator of the requisition, but perhaps should not in all instances be prepared by him.

On all operating and general supplies, so far as practicable, standard specifications should be furnished the purchasing department by the factory or engineering laboratories.

Purchase Requisition

Purchase requisitions prepared by people absolutely familiar with what is required as regards kinds, quantities, dimensions, times of delivery, etc., give the purchasing department an opportunity to devote all of its time to the buying and getting in of material on the dates required.

Purchase requisitions should be made out in triplicate at least, one copy on white paper for the originator of the

requisition; one copy on yellow paper for the purchasing agent; and one copy on pink paper for the stores recorder. (See Form 3.)

When the stores keeper has need of materials, either to cover schedule requirements, to bring his stock above minimum, or because of a general stores requisition for which he cannot supply the material, he should make out a purchase requisition, send yellow and pink copies to the stores recorder, and keep the white copy himself until the goods are received. The stores recorder will check the requisition with the stores ledgers, fill in the additional data required, keep pink copy, and send yellow copy to the purchasing agent for execution.

In case the superintendent, or any other person authorized to do so, requires material which must be purchased, he may make out a purchase requisition, holding white copy, and send yellow and pink sheets to the stores recorder who will check as above and forward yellow copy to purchasing agent.

This procedure applies to anything which is to be purchased, whether for a production, betterment, or repair order, or for general or special supplies, as in this case the unit of organization for handling materials is complete. There are, however, in very large plants or where several plants are controlled from one central office, reasons why a separate order department should be established to handle all planning and specification work and to control all purchase orders, but they are the exception, not the rule; 90% of all industrials should be organized along the lines cited above.

The manager, superintendent, or an order department, should O K all purchase requisitions for manufacturing or operating supplies not covered by maximum and minimum amounts, and for all materials required in excess of

authorized scheduled quantities. Requisitions for all office supplies, printed matter, and catalogues should be O K'd by the manager, as should also all original contracts covering schedule requirements.

The purchase requisition must in every case be checked by the stores recorder before going to the purchasing agent, so that material on hand can be checked and utilized, or substitution made if possible. He should fill in on the purchase requisition (Form 3) the "Quantity on Hand," the "Quantity on Order," net "Quantity to Buy," and "Description of Item—or Symbol" (symbol to be given if used); also giving "Last Price," which he obtains from his stores ledger. This furnishes the purchasing agent with full information as to requirements and facilitates the placing of purchase orders. The purchasing agent should be furnished by the production department with all data relative to manufacturing schedules, in ample time for him to do the necessary shopping around and contracting.

From the foregoing it is apparent that absolutely nothing should be ordered directly by the superintendent or by heads of departments; that all purchase requisitions must be checked by the stores recorder; and that the stores keeper and stores recorder must assume full responsibility for goods bought and for their distribution to some other form of inventory.

In this connection it must be borne in mind that the general stores keeper is nothing more or less than a custodian of the company's property and that he is accountable for its disposition just as much as a cashier or comptroller is responsible for the disposition of money intrusted to his custody, and that a proper system of handling general accounts for the company calls for just as close recording work on stores-keeping as it does for actual money. Therefore, no matter by whom this purchase requisition is made out,

it must first be handed to the stores recorder who will check it with the general stores ledger to determine whether he has, or has not, any of the goods required on hand or on order, or a satisfactory substitute; then, and then only, sending it to the purchasing agent, as corrected by him, to make the purchase. This will not only prevent overbuying, but will often enable substitution of material to be made for many kinds of small jobs.

This mode of procedure gives the stores keeper and stores recorder absolute control of the quantities and amounts of goods that are on hand, whether as applied to specific requirements, or as applied to maximum and minimum quantities of standard materials.

In every instance possible, the full information called for by the purchase requisition should be filled in for the guidance of the purchasing agent, as it will save a vast amount of time, both in letter-writing and telephone work, when making purchases.

Purchase Order

In connection with the purchase requisition (Form 3), the purchasing agent must be provided with a form that will constitute a contract for the purchase, as open order placing, without proposals or bids, is very dangerous and should never be tolerated except in an extreme emergency. To meet this requirement most conveniently, the form of the purchase order should be specific enough in its arrangement and detail to constitute a contract.

A contract must specify quality, quantity, price, time of delivery and point of destination, and an understanding as to transportation charges. But few purchase orders would seem to cover these points as a regular practice. The one illustrated in Form 4 does.

The purchase order should be made out in several copies.

The first or white sheet goes to the vendor; the third sheet, which is pink, goes to the stores recorder; while the second sheet, which is yellow, is held by the purchasing agent and filed by him with the yellow copy of the purchase requisition. The fourth, blue sheet, without quantity or price, will be filed by the receiving clerk from which to check description of materials received when not accompanied by memorandum. By this color scheme the distinction of each sheet can be determined at sight. Pink sheets for either requisitions or purchase orders belong to the stores recorder and yellow sheets belong to the purchasing agent. Additional copies of the purchase order may be supplied the production department and also the accounting department so that invoices as they come in may be numbered and checked.

On the bottom of the purchase order there are figures representing dates, from 1 to 31. These are provided especially for reminder purposes to facilitate purchasing When the purchasing agent makes a purchase which he wishes to have followed up, he puts a check mark on the date on which he expects these goods, or expects to hear in regard to them, and also a pencil figure above the date denoting the month; thus, if a purchase was made on the 15th day of the 6th month and the goods were not expected for 60 days, he would place a figure 8 over the figure 15 on the purchase order; or, if in 30 days he wanted to make inquiry, he would in addition put 7 over the 15.

The filing clerk makes a memorandum of this order number on a tickler card in the purchasing agent's tickler, so that on the date checked the file containing the order and its correspondence will be handed to the purchasing agent for his attention. This makes an automatic tickler system in connection with purchasing that does away with the necessity for any other kind of follow-up system. Any further information required for follow-up purposes can,

of course, also be shown on these same tickler cards. All the orders or data required to be brought up on any particular date will be put on one card and this card will be filed ahead under the index of the date required. (See Form 5.)

The purchasing agent should also keep a perpetual price file. A card should be made out for each concern from which goods are bought and on this card one or two lines should be given to each of the articles purchased from them; the price and date of quotation should be given after each article, and when any change is made in quotation, this price card should also be changed showing date of new quotation. In this way the purchasing agent has always before him the price of all material according to last quotation. This would not apply to special items bought very infrequently.

Material Receipt and Notice

Having requisitioned goods and provided a means for purchasing them, the next step is to receive them at the factory. Consequently, for the receiving department a "Material Receipt and Notice" (Form 6) has been provided as the first step toward this end. All receipts of whatever nature should be checked, counted, weighed, and entered upon this receipt. Under no circumstances can the goods be checked from the original invoice, as their receipt must be invariably entered on this form.

The material receipt and notice should be made out in several copies but must conform to the proper color scheme. The following represents its full complement and disposition: a yellow sheet, which is to be given to the purchasing agent; a pink sheet for the stores recorder; a blue sheet, together with the goods, for the stores keeper; a white sheet, when necessary, to the production department; and one sheet to be retained by the receiving clerk and filed in alpha-

betical order under the name of the concern ordered from.

Upon receipt of this memorandum, the purchasing agent should immediately send out to the stores recorder the original invoice. As soon as the stores recorder receives the original invoice for any goods, it will be his signal to bring together all four papers of the transaction held by him, viz:

1. Material receipt and notice, as made out by the receiving clerk (pink sheet).
2. The triplicate of the original "Purchase Order" (pink sheet).
3. His own copy of the purchase requisition (pink sheet).
4. The invoice from the dealer.

This method leaves absolutely no excuse for the stores recorder's not getting the proper count and record of all goods received, and it will settle all questions of difference that may arise as to quantity, price, etc., before entry is made in his stores ledgers; in this way making the ledgers absolutely reliable for the items which they cover.

It may be necessary under some conditions, such as an urgent demand for material, slow arrival of material, or non-arrival of invoices, to enter goods on the stores record as received before checking with the invoice, but this practice should not be followed as a general rule.

The purchasing agent should impress all creditors with the fact that invoices must be promptly forwarded so that they will arrive by the time the goods do; therefore, on the purchase order is a "Notice" for this purpose which reads, *"All goods are held subject to your order until we receive an invoice."* This means that no goods should go into stock until the invoice is received, so that in case of shortage or overage, or a lack of specified quality, adjustments can be made to cover any consignment before it loses

its identity by being absorbed into stock or made up into product.

Under no circumstances, except to obtain discounts from reliable firms, should payment be made on consignment of goods until they have been checked as indicated above. After this checking has been done, the purchase requisition, the copy of the purchase order, and the invoice, all duly stamped and attested by the stores recorder as being correct, should be immediately sent to the accounting department for audit and payment, a copy of "Material Receipt and Notice" remaining permanently with the receiving department.

Filing Purchase Requisitions

The factory may have requisitioned something the stores keeper did not have on hand; if so, the stores keeper will immediately make out a purchase requisition, attach the general stores requisition to it, and file in a temporary file. When the copy of the purchase order is received by him, he will withdraw from the file the purchase requisition which this covers and file them together alphabetically under the name of the concern ordered from.

As soon as the original invoice for such goods has been checked and entered on the stores ledger, the general stores requisition will be honored and properly charged; while the purchase requisition, copy of the purchase order, and material receipt and notice will be attached to the original invoice and forwarded to the accounting department.

Filing Purchase Orders

Vertical filing cabinets should be provided for the purchasing agent, and in these cabinets all purchase orders must be filed in serial order. As soon as a purchase order is made out, a file must be started, and in this file must be immediately placed with the purchase order, the purchase requisi-

tion; then all correspondence relating to this particular purchase order must be carried in the same file. When the goods are received, the file must also contain the material receipt and notice; or, if goods are rejected, the form or letter showing material rejected must be placed in this file, together with any and all other papers incident to this particular purchase order, it being understood, however, that all correspondence and papers (including quotations on machinery and shop equipment), not connected, directly or indirectly, with the purchase order, are to be filed in the regular files under subject indexing. This will cover the purchasing order files both by number and by alphabet and in this way a central filing and mailing department can be established.

The purchasing agent should have a small set of cards —one card for each different firm from whom the company buys goods—on which will appear the various dates and order numbers for each different purchase made of that particular firm. For instance, the card headed "Cleveland Twist Drill Co." might have on it 6/30, 125; 7/5, 272; 7/10, 396; 7/18, 987; each of which would indicate a different purchase order number and its date. By referring to the cards of this concern, all the papers from the "Cleveland Twist Drill Company" can be obtained relative to any purchases made from them. (See Form 7.)

Purchase orders should be back-file referenced, i.e., if orders Nos. 1, 17, 27, 40, etc., have been placed with the Crucible Steel Company, order No. 40 should have in red ink in a circle in the upper right-hand corner, the number 27, which means that order 27 is the previous order given that company; and if order No. 40 is not the particular one sought, then order 27 will be looked at. Order 27 will have on it No. 17, etc. This method enables a clerk to find all purchase orders placed with a certain company by taking

note of the last order placed. By this means information can be had as to the number of purchase orders placed with any one concern, and also as to the degree of regularity with which such purchases were made.

Filing Material Receipt and Notice

This receipt, as before stated, is made out in five copies by the receiving clerk, one copy of which is kept by him, one sent to the stores keeper, one to the purchasing agent, one to the planning department, and one to the stores recorder. When the purchasing agent receives this material receipt and notice, it is a signal for him to look up immediately the invoice and to handle it in accordance with the instructions which are given hereafter.

As soon as the stores keeper receives his copy of material receipt and notice, it is a notification to him to prepare to receive the goods, physically or otherwise, and in many instances they should be rechecked by him. If the goods received have been specially ordered by anyone in the factory, his file will contain the general stores requisitions, and these goods should be immediately sent to fill such requisitions.

The copy sent to the planning department should be destroyed after it has served its purpose, while the one to the stores recorder should be disposed of as previously indicated.

Special Instructions for Handling Invoices

All invoices, upon receipt, should go first to the accounting department to be numbered and registered and then be immediately sent to the purchasing agent.

The receiving of invoices in duplicate should be discouraged whenever it is possible. If a company operates several factories from one central point, however, it may be

necessary to have invoices in duplicate. If they are so received, one copy should immediately upon its receipt be stamped "duplicate" in large letters across its face.

When the purchasing agent receives an invoice from a shipper, he must take his copies of the purchase order, purchase requisition, and material receipt and notice, and check them against the invoice. If the price, quantity, and quality of the goods received are found to be correct, he should O K these in the proper places on the invoice, and immediately forward this invoice to the stores recorder who, as before stated, will recheck these papers, attach them to the invoice and immediately forward them to the accounting department.

In the event of there being a difference in the price, quantity, or quality of the goods, the purchasing agent should make out a claim voucher, giving the exact quantity and quality of the goods received, also the amount of the claim, what it is for, and on whom it is made. He must attach this to the original invoice, and send it to the stores recorder. (See Form 8.)

When the stores recorder receives an invoice with a claim voucher attached, he will enter in his Stores account the quantity of the goods received as designated by the material receipt and notice, check invoice accordingly, and if claim is for shortage of goods to be filled by subsequent shipment, he must send only the invoice to the accounting department. If this claim is for other than shortage, he will attach all of his papers and forward them to the accounting department as already described.

When the accountant receives an invoice with a claim voucher chargeable to the consignor attached, he will deduct the amount of claim, in the deduction column, from the original invoice to the credit of the consignor, and charge the Stores account with the net quantity. If the claim

voucher is chargeable to a party other than the consignor, however, the accountant must then enter the amount of the original invoice to the credit of the consignor and charge the Stores account with same, and then make out a charge voucher to cover the amount of the claim, crediting stores, and charging the party designated by the purchasing agent for the amount of the claim.

It can readily be seen that this not only allows for the immediate entry of material into stores, together with its price, but that there is no chance of paying the amount in full when there is a claim against the creditor.

When the claim is allowed and a credit memorandum is received from the consignor, it must only be attached to the charge voucher; no entry of it is made, in the event of claim being made for a shortage in shipment, as the additional material sent at some subsequent date must have a new invoice.

Upon advice from the consignor to the purchasing agent that goods have been back ordered, in whole or in part, or if for any other reason the purchasing agent wishes to cancel an order and does so, copies of this cancellation should be forwarded to the stores keeper, production department, and stores recorder who will forward his copies on file for that order to the accounting department, marking them "Balance Cancelled" and giving date.

All freight or express bills presented must be checked with receiving clerk's copy of material receipt and notice, and O K'd by him after verifying each item. As the receiving clerk thus verifies each item of freight, he will enter on his material receipt and notice sheet the date of his O K and the date of the freight bill. The receiving clerk must ordinarily O K the entire bill, if correct, before the freight bill can be passed for payment.

The receiving clerk should be held strictly responsible

for all material received by him, and for freight and express items O K'd by him, i.e., as to consignments, weights, etc., and a regular audit of the freight bills with the stores records should be made as with all other departments.

CHAPTER IV

GENERAL STORES

Their importance, their control, and their relation to inventories, production, and accounting, together with a classification for statistical purposes.

CHAPTER IV

GENERAL STORES

The following is a brief outline of certain standardization work, including its nomenclature, that must be agreed upon or understood as a basis for factory operations, before going into more complete detail concerning actual instructions, specifications, etc., in connection with stores-keeping.

Orders

Classification of Orders

Before undertaking to lay out the detail incident to planning and cost work in a factory, it becomes necessary, as a first step, to understand under just what conditions orders shall be issued; by what names; what relation they shall bear one to another; and the kind of work covered by them.

The following tabulation shows the names of orders that should be used in industrial work. Prefixing a letter to each order number will always indicate the nature of the order. By this means each kind of order can have its own serial number.

(A) Contract or Sales Orders
(B) Manufacturing Orders
(C) Production Orders
(D) Prorating Orders
(E) Betterment Orders
(F) Repair Orders
(G) Stores Orders

These seven kinds of orders should cover anything and everything in a factory pertaining to labor, material, and expense.

(A) Contract or Sales Orders

A "contract" or sales order is simply a means for registering, by name and number, the whole quantity of some given contract which, if too large to be put through a factory in total, would be divided into several production orders. Or, again, if too small to be manufactured ecomically, the sales order would be combined with several other sales orders into one production order, so as to provide a volume sufficiently large to justify a schedule. (See Chapter IX.)

In the manufacture of such a product as rifles, for instance, sales orders would naturally be large, and must be divided into several production orders; first, because the bulk is too great to put through a factory in one order; and second, because from a cost point of view information for control of the output from week to week and month to month would not be obtained often enough. In other words, on a contract for rifles that required a year or more to manufacture there would not be a satisfactory control of factory operations during that period were it not divided up into orders sufficiently small to give full and complete costs frequently; while a product like machine tools for instance—of which but one or two are sold at a time—might be made up in batches of twenty-five or fifty, either for stock or as a combination of sales orders, so as to get a sufficient volume on which to compute satisfactory costs.

(B) Manufacturing Orders

A "Manufacturing Order" is exactly like a contract order; simply being a means for registration and showing by this registration the divisions and quantities for proces-

sing purposes on which it is desirable or necessary to close out total manufacturing costs under either one of two methods:

1. By applying overhead as well as labor and material costs to each component—perhaps also to each operation,
2. By applying overheads to each complete unit covered by a "Production Order."

For simplicity, the latter is preferable; for accuracy and insurance purposes, the former is better.

(C) Production Orders

A "Production Order" is an order not only of registration but also of issue; i.e., it is issued to a factory for the actual producing of something covered by a sales and manufacturing order (except in a plant run under conditions whereby its product is all made for stock; in other words, manufactured to finished stores stock, from which the sales department would always draw goods).

All sales orders are necessarily received from sales or executive department. All manufacturing orders are prescribed by a works manager, together with a schedule covering the same. All production orders are issued or provided for by a production department, and must be in accordance with manufacturing orders and their schedules.

Therefore, the production order for an individual piece or component would, in theory at least, be a sales order, say No. 1501; a manufacturing order, say No. 1; a production order, say No. 1; plus the component symbol, say "26-117," the whole presenting a symbology as follows:

"1501-1-1-26-117"

This would be the complete symbology for identifying any and everything in connection with a piece or component

with a sales order in which "1501" is the order from the executive office; "1," the order from the works manager to the production department; and "1," the order from the production department to the factory to make a certain piece in some definite way.

Production orders are of several classes of varying purposes, as follows:

1. Processing Production Order
2. Assembling Production Order
3. Tools Stores Production Order
4. Prorating or Expense Production Order

Before going further in connection with orders, an understanding should be had concerning the division in a product requiring different orders.

A model of something is a final and complete expression of production. A model may consist of units, parts, and pieces.

A unit is something that is operative in itself and subject to usage on any one of several models; it consists of an assembly of parts and pieces.

A part is an assembly of two or more pieces, in itself inoperative until assembled into a unit or model, and consists only of an assembly of pieces.

A piece is an individual component processed in some definite form, which may be assembled into a part, into a unit, into a model, or into all three.

For example, a rifle would be a model; the lock mechanism would be a unit; and the barrel or the butt a part. Finally would come the individual pieces which are assembled into, or with, the foregoing.

Therefore, it is necessary to issue a production order to cover the making of individual pieces; and an assembling production order, for such things as constitute a part. These

are then closed out into component stores and an assembling production order issued for a unit, which might consist of two or more pieces or parts, and which would again be closed out into component stores and redrawn by a final assembling production order for the completion of the model.

Again, tools that are manufactured in a tool room in large quantities, such as reamers, drills, cutters, screw-drivers, etc., are made under a stores production order, because when completed this order will be closed and the tools charged to general stores, whence they are distributed to the factory and thus become absorbed into expense.

(D) Prorating Orders

In nearly all lines of manufacture there are certain materials used and certain work done which cannot be so figured as to be directly chargeable to an individual piece or component. By this is meant such things as plating, painting, enameling; or, in rifle manufacture, browning, heat-treating, hardening, etc. Therefore, it is proposed that for such items, "Prorating Orders" be issued, which will enable work of this character to be done for any one or for several manufacturing orders combined. Then the total expense of same for some timed period—in no instance longer than a month's output—would be prorated over the number of pieces done during that period. That is to say, if 15,000 pieces were heat-treated during a month, each component so treated would be charged with a pro rata amount of expense for the work, which would be in addition to the expense that was put upon it by the regular production order. In other words, this is a sort of standing order for all the work done by a certain operation, whether the operation covers a piece from one or from several production orders.

If the operation on such work as this, however, is for

the same piece practically all the time, it would be considered as an operation in the regular processing of the piece and would then come under a regular production order number.

(E) Betterment Orders

A "Betterment Order" is an order issued to a factory for the manufacture or installation of all items that increase the inventory of fixed or non-merchantable assets, or, in other words, investment assets—which consist of the plant and the things that are used in or by it in its operation.

Betterment orders should be issued, for instance, for real estate additions and improvements; for the making of additions to buildings or building improvements; for the installation of all machinery; for power improvements or extensions, etc., etc., according to the classification submitted below—which would be considered a standard classification for such things; and for this reason assets are divided up into this classification because each item calls for a different percentage of depreciation, except real estate, which, of course, rarely ever depreciates but usually appreciates. It can be seen that this classification is laid out on the Dewey Decimal System plan so that a distribution by accounting machines, such as the "Powers," is possible. Therefore, it must be borne in mind that each subdivision must always be the same, for which the percentage of depreciation indicated would be written off.

E1 REAL ESTATE. No depreciation.
E2 BUILDINGS AND BUILDING EQUIPMENT
- E2.1 Buildings. 2 to 2½% per annum.
- E2.2 Building Equipment. 12 to 15%.
- E2.3 Electrical Service, outside of lighting, 15 to 20% per annum.

E3 Office Furniture and Equipment. 15 to 20% per annum.
E4 Machinery and Tools. 7½ to 10% per annum.
E5 Dies, Jigs, Fixtures, and Gages. 25 to 50% per annum, according to their character and usage.
E6 Power Plant. 10% per annum.
E7 Shop Fixtures and Fittings. 25% per annum.
E8 Patents, Patterns, and Drawings
  E8.1 Patents. According to their life.
  E8.2 Patterns. 33⅓ to 100% per annum.
  E8.3 Drawings. According to their character.
E9 Railroad and Railroad Equipment
  E9.1 Railroad. 15% per annum.
  E9.2 Railroad Equipment. 20% per annum.

This provides a symbology in which "E" denotes fixed investment or a "Betterment Order"; the first figure indicating the class of betterment order, and the decimals indicating the subdivisions. Each of these nine classes can be extended to cover all the subdivisions which may be required. Thus machinery and tools can be divided into:

E4.1 Machines
E4.2 Tools

Machinery can be still further subdivided into planers, automatics, screw machines, profilers, etc., etc., if anything is to be accomplished by so doing.

From the foregoing it is perfectly evident that there are: (1) for all improvements or betterments, a set of standing orders covered by "E" plus the number indicated; and (2) as repair orders can be indicated by "F," that for repairs, a similar set of standing orders are to be used under "F," plus the number indicated; and (3) that still another set of numbers can be used to cover depreciations, so that for all

investments and repairs to same there will be no other orders of any kind issued. The entire arrangement is such that all is subject to accounting machine methods of distribution, and these same methods should be adhered to for all distributions required by a factory.

Finally, it is to be understood in connection with all betterment orders that they should bear the same overhead or factory burden as manufacturing or production orders.

(F) Repair Orders

To repair anything is to restore it in some degree to its original condition; i.e., to recover a loss that has taken place due to usage, depreciation, etc. Based on this, in a modern method of accounting, reservations should be made for depreciation under such a combination of conditions that it is permissible to draw upon these reservations to pay for repairs. Otherwise there is a possibility of a big liability account being established which may, in part at least, be fictitious. In other words, if a certain sum of money is set aside to cover depreciations, and depreciations are recovered by the application of repairs, the money set aside for this purpose should be used to pay for the repairs, and not have, as is usual, a double expense thrust upon the business—one in the form of depreciation for replacements, and another for repairs.

The point to be made here, however, is that the same classification as illustrated for "Assets," must be used for "Repair Orders" (F). Looked at from another point of view, it means that instead of having a large number of kinds of repair orders, they would be confined simply to a set of standing repair orders, classified exactly according to the asset classification of investments, and, as illustrated under "Betterments," be carried into as fine a classification as desired by simply adding figures on the decimal basis.

The old-fashioned standing order has become practically obsolete. There was a time when there were standing orders to cover such items as were not charged to Plant Assets, Plant Production, and Plant Repairs; and these consisted of such items as window washing, shop lubrication, shop sweeping, shop trucking, watch and fire services, etc., etc., all of which are absorbed into assets by way of overhead charges put on production.

In fact, all old methods of accounting employed a large number of standing orders, some of which related to labor, some to material, and some to a combination of labor and material. Most of them, however, upon close analysis, lacked any possibility of placing direct responsibility on any one for their variation from month to month and year to year.

Later and newer accounting methods have entirely eliminated the old-fashioned standing order, and furthermore, all the elements of manufacture have been reduced to the three primes:

1. Labor
2. Material
3. Expense

Therefore, all accounting work is so designed as to deal directly with these three items, and to do so a certain method of distribution must be adopted which will give the labor, material, and expenses of each department—at least monthly —divided into direct and indirect items. This has invariably been found to be of much more value for administrative action than was the old-fashioned standing order.

(G) Stores Orders

"Stores Orders" consist of orders placed in the factory for the manufacture of those items of which a maximum and

minimum quantity are supposed to be kept in stores. They have particular reference to small tools, such as drills, reamers, screw-drivers, taps, dies, etc., which are to be made up in quantity under a stores order and taken into stores as an asset and held there until distributed to the factory over properly signed requisitions. Some of these articles, such as screws, for instance, can be made up in one or two days' output in sufficient quantity to cover the requirements of a period of several weeks or months.

This arrangement gives the stores keeper full opportunity for ordering anything that is carried in stores on a maximum or minimum basis, whether it is to be purchased outside or whether it is to be made in the factory.

Stores-Keeping

Stores

No department in any manufacturing business contributes more to its health or wealth than do the departments of stores-keeping, which are always three in number and sometimes four, as shown below:

General stores, which cover all purchases of any kind whatsoever.

Component stores, which cover all pieces and parts that have been completely processed.

Finished stores, which cover all completed units or models ready for shipment.

Shop stores, which cover sub-stores stations as distributing points for stores issued on a monthly supply basis.

Requirements as to Stores

Many plants undoubtedly run under what is known as "continuous manufacture." A contract for 240,000 units

would mean a contract order for that many. If these are to be made up in a year's time, they could be divided up into twelve manufacturing orders of 20,000 each.

These manufacturing orders would then be divided again into production orders, i.e., a production order for each component required, and for each assembly required whereby components are assembled into a complete unit. Therefore, on a contract order, the purchasing agent would go to market for materials long in advance of actual manufacturing requirements and would make contracts for such materials under specified deliveries.

From this it can readily be seen that if it takes 30 days to get material from the market, and 30 days to process the component from this material, orders for material will have to be placed at least 60 days (plus some factor of safety) in advance of the placing of a manufacturing order in a factory; consequently, all terminating dates on a schedule for purchases should be determined at least 90 days in advance of the final assembly dates, specifications for which should be furnished by the production department.

It will usually be necessary to have nearly all productive material protected by reservations, and these reservations will be a very important factor in stores-keeping; therefore, stores balance sheets have been provided to take care of this in detail.

Routine of Stores-Keeping

In order to understand how dependent accounting is on a proper classification of orders, it is necessary to have a clear idea of what the fundamental basis of industrial stores-keeping and accounting is.

All materials upon their receipt must be put into general stores—general stores being so broad in its scope as to cover everything that is purchased. Not only does it include

material for processing and supplies for operating, but also everything in the shape of equipment. In other words, if a new machine is bought it must first go into general stores (at least by way of record) and be held there in inventory until it is delivered to the factory over a properly signed requisition chargeable to a betterment order, to which will then be added the labor and materials used for installation, the completion of which will transfer the entire cost to another form of inventory.

The same rule applies to any piece of furniture or office or shop equipment which may be bought, for it is only by thus passing *everything* through general stores and rendering a requisition in payment for it when it is drawn out, that a distribution of these stores can be made either to production orders, assets, or operating expense, and it is the only basis upon which an order department can maintain a control of orders and their proper distribution. In other words, materials after going into general stores are held there in inventory until they are requisitioned out for some production order, betterment order, repair order, or stores order; the requisition being used simply to credit "General Stores" and to charge the order. Thus all production, betterment, and stores orders become "Work in Progress."

At the end of any month the total amount of the production and betterment orders completed are credited to "Work in Progress" and charged to Fixed Assets, Component Stores, or Finished Stores, as the case may be. That is to say, as material is drawn from general stores for any production or betterment order, it has added to it the labor and expenses incident to its processing operations, and is constantly held in inventory as "Work in Progress" by the use of requisitions and time tickets. Upon completion, the total cost of the order is credited to Work in Progress and charged to its proper classification.

By this relationship between orders, general stores, requisitions, and time tickets, protected by a proper system of names and numbers, a perpetual inventory in all stages of conversion between the purchase of the material and its transformation into something else is made possible. In this way all labor, material, and expense used in a factory are actually converted into tangible assets at the end of each and every month.

Usually all the work connected with the keeping and recording of stores is placed under a general stores keeper and a stores recorder, whose duties and relations may be outlined briefly before going into stores-keeping in general.

General Stores Keeper

The attempt is often made to put the entire stores-keeping system under a production or planning department. Usually this is not very satisfactory, for the reason that the purchasing agent and the stores keeper have large problems in the handling of material entirely foreign to production, such as the buying and handling of all factory operating supplies and general office supplies, which are nearly always maintained on a maximum and minimum basis. These include fuels, oils, waste, small tools, etc., and in addition thereto, equipment, furniture, fittings, stationery, catalogues, etc., and it must be borne in mind that all of these materials should be handled just as carefully as the productive materials. It is the physical storage, handling, and delivery of these materials that constitute the real work of a general stores keeper.

To cover the requirements, the organization should be laid out in such a way that the general stores keeper and purchasing agent may work together as closely as possible; that is, the general stores keeper should be directly responsible to the purchasing agent in so far as all general stores

(raw material) and their inventories are concerned, but should be under a works manager in everything pertaining to the physical conditions required in a plant for the storing or shelving of goods and for the physical methods to be employed for the delivery of goods to the various parts of the factory.

Stores Recorder

There are two methods by which a stores recorder can be governed in an organization—first, whereby the stores records or ledgers are controlled by the purchasing agent (which under ordinary circumstances is the usual way); and second, whereby the records and all work pertaining to them are controlled by a production department.

As the general stores keeper should be at liberty to give most of his personal attention to the movement of stores as a physical requirement, there will have to be, in either case, a stores recorder to take care of all stores transactions by way of the stores ledger, to check purchase requisitions, to price general stores requisitions, to check invoices, and to make out purchase requisitions to cover maximum and minimum amounts.

The undesirability of putting the stores ledgers and records in the charge of any other than the stores keeper and the purchasing agent, is again apparent here, for the simple reason that all non-productive materials and operating supplies must be carried in exactly the same ledgers as productive material. However, as stores cannot be carried in one general stores room, but must of necessity be located at different points, the location of the stores recorder will have to be at some central point of operation, preferably in or adjacent to a production department, to which he can supply whatever information it may require. In addition to this, the general stores keeper should have charge of

the receiving department and have under him a receiving clerk in charge of such department.

By this method of organization, the purchasing department is held entirely responsible for the purchase of material, its delivery into stores, its placing into a stores inventory account, and its final delivery to the factory for processing or usage. The responsibility in connection with the latter will be set forth later, but attention is here called to the fact that this method creates a complete unit of organization in itself, a highly desirable thing to do if possible.

Bureau of Censorship of Materials

On the other hand, it is quite possible that it may be necessary in a plant of large size to have a "Bureau of Censorship" on materials, first, to cover purchasing, and, second, to cover withdrawals of materials from stores for usage; in which case all requisitions for purchase which are or are not covered by a production order, betterment order, repair order, or maximum and minimum quantities, would have to be referred to the bureau of censorship for approval. This bureau of censorship would naturally be controlled by the production department. As all requisitions for the actual withdrawal of material from stores would be made out in this same department, it would be necessary to place in this department a stores recorder who would have charge of all stores transactions, as stated above.

Under this system, foremen and all others having authority to do so, have to use a "request ticket," and this is converted into a general stores requisition by the stores recorder or his assistants. In so far as the accuracy of stores records are concerned, this plan may be as good as the other, but there would seem to be two undesirable things about it. First, the purchasing agent or stores keeper cannot be held responsible for the inventories of material which he has

under his charge, and, second, it would seem that a great deal of delay in getting requisitions filled for the factory might be occasioned. In other words, from an accounting point of view it would not make any difference; from an organization point of view and from a delivery point of view it might not work so well.

Control of General Stores

As has already been explained, materials are bought and passed into general stores and held there in inventory until they are requisitioned out for some production order, betterment order, repair order, or standing order; a requisition being used to credit general stores and to charge the order. Thus all production and betterment orders become "Work in Progress." At the end of the month, the total amount of production and betterment orders completed is credited to "Work in Progress" and charged to Investment, Assets, Component Stores, or Finished Stores, as the case may be.

Under this routine, as material is drawn from general stores for any production or betterment order, it has added to it the labor and expense incident to its processing operations, and is constantly held in inventory by the use of requisitions, time tickets, etc., until the work upon it is completed; then credits, as cited above, are made and the total cost of the production order, when completed, is charged into Component Stores for all finished pieces or parts as may be required for stock, and into Finished Stores for all completed units. Then, Finished Stores is credited and Sales is charged for all goods shipped, after which the transactions become current bookkeeping. Therefore, from this it can readily be seen that it is absolutely necessary to keep control of materials by the proper use of requisitions, time-keeping tickets, and means for expense distribution, because the whole process is one by which all the material,

labor, and expense of a factory are *converted into assets at the end of each month.*

From the above, it becomes apparent at once that, first, the stores keeper is the merchant of the plant; second, that every requisition is a check given in payment for material; third, that as in a banking business, a centralized clearing house must be organized to handle checks and get them cleared to their proper charge account.

General Stores Record

Theoretically, a stores record sheet has many functions. It is a record of all material given out, and shows for what purpose it is given out, etc.; it is a perpetual inventory of the quantities and the value of materials on hand at any given time, and a perpetual inventory of the quantity outstanding on orders and under reserve; it is a means for pricing all requisitions calling for material; and, finally, it becomes a complete record of any and all variations in price, and furnishes chronological information as to quantities of material consumed for any given time.

A thorough understanding of the means of recording the issue of material from stores into "Work in Progress" and *vice versa* may be derived from a consideration of the form of general stores record shown in Form 9, the headings of which are almost self-explanatory.

It will be noticed that the heading of this sheet is made to show not maximum and minimum quantities (as is usual), but such an amount of material as will protect a factory's operation for whatever length of time it takes to get material from the market, taking into consideration reservations. Thus, the caption "When balance on hand, less reservation, is under ....., order....." means that no reservation can be considered available in considering the low point at which to buy, and that when the

quantity is down to a very low point additional quantities must be ordered up to some maximum point.

If a unit of any kind is to be made at the rate of 3,000 per day, and it takes ten days to get stock after placing the order, the minimum inventory at the factory would be, under ordinary conditions of operation, sufficient materials of all kinds for 30,000 units, and it would be the stores keeper's business to notify immediately the purchasing agent when the inventory on such material was down to the ordering point, as the 30,000 minimum would be practically all consumed by the time the new shipments were received. A factor of safety should be allowed which would perhaps make material for 40,000 units the low point at which to re-order.

At the top of the record sheet is also shown a description of each item—each item being on a separate sheet. The unit of measure by which the item is bought is given, as pounds, gallons, pieces, yards, etc., and immediately under this is shown the location of material as to building number, floor number, aisle number, and bin number. In this way the stores recorder will have absolute information as to the location of any and all kinds of material, and can quickly and easily find or check it over if it becomes necessary. Further, this gives the stores recorder absolute command of all stores, by record, and will enable him to show location on requisition, so that the stores keeper can send stores clerks or truckmen to the proper point for the drawing of material to be delivered.

In a properly arranged stores-keeping department the entire layout of a floor space, aisles, bins, etc., should be represented by a drawing or diagram. This will greatly facilitate the work of the stores keeper, and simplify the breaking in of new clerks, stock men, etc., as they are taken into the employ of the company from time to time.

These stores record sheets must be indexed under the classification mentioned hereafter for ready reference and handling, as regards posting, etc. The stores recorder should be held absolutely responsible for the placing of his requisition for purchase or manufacture (the latter in case of items made by the factory and carried in stock, such as drills, reamers, taps, dies, etc.), but not for delays in purchasing or deliveries, provided his requisition has been given to the purchasing department or the production department in time.

The first entry on the stores record sheet will be the inventory at the time the sheet is opened, under the "Received" column, showing the date of inventory, etc.; following this, in the first column, "Ordered," will be entered the date, purchase order number, and quantity. Upon receipt of "Material Receipt and Notice" by stores record clerk, he will immediately enter the amount shown on same in the "Received" column of the stores record sheet, giving date, purchase order number, and quantity; checking his "Material Received" memorandum, purchase order and purchasing requisition at the same time. Upon receipt of invoice, these three forms will be assembled with the invoice, and the unit price entered in its proper place, and all papers then forwarded to the accounting department. This operation will be repeated for all items received.

As fast as requisitions are received at the stores room and the material is delivered, the quantity, called for by the requisition will be entered in the "Issued" column of the stores record sheet, showing the requisition number and date on which the material was delivered, together with the quantity and unit price. At the same time that this is done, the unit price and amount will be extended on the requisition, and *always* the balance of the quantity on hand must be entered in the "Balance" column. A column has been pro-

vided showing "Reserved," so that no subsequent production order can be put into the factory demanding the same kind of material and obtain it, unless there is an excess of the amount reserved for the first production order. Under the "Reserved" caption the date and quantity of the reserve are entered, and under "For" will be shown the order number for which the material is reserved. As fast as the production order number is provided with this material, it will be entered in the "Issued" column, the same as any other material. Therefore, it can readily be seen that the amount available for any new production order will be the difference between the balance in stores and the total amount reserved.

At the extreme right of the stores record sheet are provided five columns for "Balances"; the first column showing balance "On Order," the difference between the "Quantity" column of "Ordered" and "Received"; the second column showing balance "In Reserve," the difference between "Received" and *red ink* entries under "Issued" column; the third column showing "Available," the difference between "In Reserve" and "On Hand in Stock"; the fourth column showing, quantity "On Hand in Stock," the difference between "Received" and "Issued"; and the fifth column, "Value on Hand," or inventory value of "On Hand in Stock."

The unit price entered on the stores record must be the absolute cost, which means that all trade discounts must be deducted, and the net price per piece or quantity used, instead of the total purchase of any particular material. By this means this sheet becomes not only a stores record of goods received and given out, but also the standard price sheet for the use of the purchasing agent and the source from which the stores recorder enters on the requisition for purchase the last price paid and other data required. A ten days' cash discount, etc., should never be taken off the figures as shown on the invoices, as this form of discount is an earning of

the financial department and should be credited to its administration and not taken into consideration in connection with the cost of production.

The price to be used for any costing or inventory purposes should always be the *last purchase price* from any regular source of supply. If, however, material has been purchased in large quantity, or of special quality or price, an effort should be made by the record clerk to carry these prices with the quantity so purchased.

The particular thing to which attention should be called, in connection with the keeping of stores and stores records, is the importance of keeping these records posted up to date—up to the minute—as to the quantity received, quantity given out, balance on hand, and prices. The value of this cannot be overestimated, as these records become a bureau of information for several purposes; first, for the purchasing agent; second, for the planning department; third, for the cost department in making costs and distributions (as on these sheets every requisition is priced for the amount of material drawn over the requisition). They give a chronological history of each item of stores, and of the quantities and various kinds of materials or supplies used, so that in a very short time the stores keeper and purchasing agent can establish from this history absolutely correct maximum and minimum quantities, and thus reduce the cost of investment for material to a minimum. An examination of these stores record sheets will always indicate to the purchasing agent or works manager how well purchases are being made and how much unnecessary investment may have been made in any items by purchasing in too large quantities. Finally, the perpetual inventory is kept checked against the controlling account by means of these stores records.

From the foregoing it can be seen what an all-important

proposition the keeping of the stores records is, and particularly the keeping of these records posted accurately and right up to date, and with due consideration for reservation.

Classification of General Stores

There are two prime classifications into which general stores should be divided, for statistical and indexing reasons:

(1) Office Materials, (2) Factory Materials. A complete classification for accounting and general purposes is given in the stores ledger shown in Form 95.

Factory materials for such purposes are divided into four classes as follows:

(a) Operating Supplies
(b) Manufacturing Supplies
(c) Manufacturing Materials
(d) Equipment

This classification is not used for keeping stores or for accounting work, but is used for indexing purposes; and also provides a means whereby statistics can be obtained at any time regarding the amounts of such materials used. These statistics are very valuable because of the fact that contracts are often made and prices obtained based on the quantities consumed of any particular commodity, and a little adding machine work on the stores records in connection with this classification will always reveal this for either statistical or purchasing purposes. In order to make this classification perfectly clear, the kinds of items that would go into them are given below.

1. Office Materials—Classification

These consist of any and all kinds of supplies for office work, for recording and accounting work, advertising

matter, etc. This kind of material should be classified on the indexes for stores-keeping about as follows:

Advertising Matter	Ink Wells
Bands, Rubber	Letterheads
Baskets, Waste	Pads, Scribbling
Blotting Paper	Paste
Brushes, Typewriter	Pencils
Carbon Paper	Punches
Clips	Pen Holders
Copy Paper	Pens
Envelopes	Pins
Erasers, Pencil	Ribbons, Typewriter
Erasers, Typewriter	Rulers
Forms, Cards	Second Sheets
Forms, Loose-Leaf	Shorthand Books
Forms, Printed	Stamp Pads
Inks, Stamping	Trays, Letter
Inks, Writing	Twine, etc.

2. Factory Materials—Classification

These, as stated above, are divided into four classes for indexing purposes only, the first of which is:

(a) Operating Supplies. These consist of all such supplies as are used for operating, or making repairs to the plant or to the machinery in the plant, and will consist of about such a classification of items as given below, although it must be borne in mind that there are items in this classification that might be used as productive material.

MATERIALS

Asbestos	Brooms
Babbitt	Brushes, Air
Belting	Brushes, Motor

Carbon	Packing
Compounds	Piping
Electrical Supplies	Plumbing Supplies
Emery Cloth and Paper	Potash
Excelsior	Rivets
Fuels	Rope
Gaskets	Rubber
Glass	Sandpaper
Glue	Soap
Inks, Office	Tin
Iron, Galvanized	Toilet Paper
Leather, Lace	Twine
Nails	Waste
Oil Cans	Wax
Oils	Wire

TOOLS—SMALL AND HAND

Bits	Handles
Checks	Jigs
Chisels	Knives
Dies	Miscellaneous
Drills	Soldering Irons
Emery Wheels	Stones
Files	Torches
Hammers	Wrenches

(b) Manufacturing Supplies. These will consist of all kinds of material that are used in the product made for sale, and measured out in quantities in such a way as not to be chargeable to any specific piece, part, or unit, for the reasons that it would be almost impossible to measure the exact quantity used in or upon any individual part. This kind of stores is often drawn out in bulk, such quantities being used as are required, and the remainder returned to stores on a

credit memorandum; for it is impossible in many instances to specify the exact amount of material needed. The following items indicate the nature of the articles that go into this classification:

Alcohol, Spirits	Screws, Machine
Alcohol, Wood	Shellac
Oil	Tape
Paints	etc.
Putty	

(c) Manufacturing Materials. These consist of all materials which are used in the actual product made for sale, and which are charged directly to piece, part, unit, etc., or to a production order in its entirety.

Properly speaking, both manufacturing supplies and materials are one and the same thing; but the reason for recommending a subdivision of these two is that it is necessary to exercise a great deal more care with manufacturing supplies than it is with manufacturing materials in issuing them to the factory, since the exact quantity of the former required for a given production order is frequently not specified or limited.

(d) Equipment. For indexing purposes, this consists of all such equipment and machinery as is bought for the plant, and not, as yet, charged out to the plant under a betterment order.

Classification of General Stores—For Stores-Indexing

It is almost impossible to provide at the start every item of classification that will be required; but a general scheme should be adopted which may be added to from time to time as classifications for inventory become necessary. It is preferable to classify primarily under the kinds of materials used, for two reasons: it makes the handling of the stores

record sheets much more rapid, and at the same time it gives a statement every month of the consumption of the various kinds of materials that are used.

As before stated, general stores are divided into two prime classifications: (1) office materials, and (2) factory materials, which are the same for both stores-indexing and statistical purposes. The subdivisions of these two classes are as given below:

Office Materials. Subdivision same as already given. (See pages 80, 81.)

Factory Materials. For purposes of stores-indexing, these materials should be classified about as follows, according to the kind of material and the items made of that material:

I. BRASS AND BRONZE

Castings
Cocks
Cups, Grease
Cups, Oil
Sheet
Rod
Screws
Valves
Washers
Wire
Miscellaneous

II. COMPOUNDS

Commutator
Cutting
Drilling
Polishing
Miscellaneous

III. COPPER

Sheet
Tubing
Wire
Rivets
Washers
Castings
Miscellaneous

IV. EMERY

Cloth	Wheels
Powder	Miscellaneous

V. FIBRE

Rings	Gaskets
Disks	Miscellaneous

VI. FUEL

Coal

VII. GLASS

Disks	Window
Tubes	Miscellaneous

VIII. IRON

Bar	Sheets
Bolts	Screws
Castings, Gray	Tubes
Castings, Malleable	Washers
Forgings	Wire
Nails	Miscellaneous
Rivets	

IX. STEEL

Shafting	Tool
Sheet	Tubing
Bar	

X. LUMBER

Boards	Timber
Planking	Miscellaneous

XI. OILS AND GREASE

Lubricating Oils	Greases

XII. PACKING

Asbestos	Metallic
Gaskets	Wick
Hemp	Miscellaneous

XIII. PAPER

Books	Stationery
Catalogues	Wrapping
Circulars	Sand
Drawing	Miscellaneous
Printed Form	

XIV. RUBBER

Diaphragms	Seatings
Gaskets	Sheet
Hose	Tubing
Rings	Washers

XV. LEATHER

Belting	Washers
Lace	Miscellaneous

THE ISSUING OF MATERIAL FROM STORES

General Stores Requisitions

Form 10 is to be used for the purpose of obtaining material and supplies from stores, as no items of whatsoever nature bought by the company should be issued by the stores keeper except over this form properly signed. The production department will issue all requisitions for materials needed for regular production orders, but not always for supplies for operating the plant. The requisition must, under all circumstances, show the order number to which the material is to be charged, as well as the number of the department which draws the material. Where materials for

operating supplies, etc., are drawn, which are not covered by any production, betterment, repair, or standing order number, the requisition must, without exception, show the department drawing the material and must be properly signed by the head of that department. Under no circumstances can the head of one department use his requisition to draw material from another department, or from the inspectors; *through general stores only* will it be honored. In every instance the quantity and kind of material must be plainly set forth upon the requisition as follows:

1. Material, symbol, and number of requisition.
2. Charge number or order number which is entered against the proper class of order as shown on the requisition. The symbols shown thereon designate the following classes of orders:
   - (A) Contract or Sales Orders
   - (B) Manufacturing Orders
   - (C) Production Orders
   - (D) Prorating Orders
   - (E) Betterment Orders
   - (F) Repair Orders
   - (G) Stores Orders
3. The quantity designated and a clear description of the article.
4. The department to which delivery is to be made and the time when delivery is required.
5. The signature of a duly authorized party.
6. The date on which made out.

Exceptions may be made to this rule in the case of the manager and any superintendent, by allowing them to use their respective pads, which should be especially assigned to them by a key number, as they find it necessary. When this is done the requisition must be O K'd by the superin-

tendent, the department for which the material is drawn properly shown, and a credit memorandum made out in favor of the department from which the material was taken, and this must be attached to the requisition.

It must be borne in mind, as previously stated, that the stores keeper is the merchant of the plant, that everything bought by the factory is put into his custody to be sold by him to the various departments, and that these requisitions are nothing more or less than checks made out and signed as payment for such items as are drawn. Consequently, in any instances where the requisition is not properly made out and all the necessary information given, the stores keeper *must refuse to honor it.*

It is essential that the stores keeper should bear in mind that his department must be conducted as an absolutely independent business; he buys goods over his purchase requisition, and sells these goods to the factory over its general stores requisitions. Every night his stock should be in balance, and, if it is not, he is to be held strictly accountable.

In large plants it is usual, as before stated, to have a chart called "Stores Location Chart," so that the stores recorder can accurately route each requisition by entering this information in the space provided on the form.

It is not recommended that these requisitions be made out in duplicate. The stores recorder will be either located in, or adjacent to, the planning department. All requisitions for production material will be accompanied by a routing tag which should be attached by the stores keeper to each lot of material called for by a requisition. On all other materials, such as operating supplies, etc., which might be requisitioned direct by department heads, the stores keeper should put a routing tag on the material to its proper destination which, of course, will be indicated on the requisi-

tion itself. It is a much safer way to route material than it is to make duplicate requisitions which cannot be fastened or tied to the material in any convenient way.

Stores Credit Memorandum

Form 11 is to be used by all heads of departments for crediting any department with materials drawn from stores which it cannot or does not use, and which are returned to stores. It must be borne in mind that all material drawn over a requisition is charged up to its proper order or account number immediately after it is taken from the stores department, and if subsequent work or operations show too much material has been drawn, or defects are discovered in the material, this form is used to give a credit to the job. For this purpose it is immediately sent to the stores keeper, together with the surplus or rejected materials. Unless the material accompanies this *credit memorandum,* the stores keeper will not accept it, for he must get his material back into stores before he can apply the credit. The credit memorandum must be signed by the planning department, or a department head authorized to do so, and also by the stores keeper, before it is turned over to the stores recorder, where the material must be priced exactly the same as in the requisition, be entered on the received side of the stores record, and, under "From Whom," the production order number be entered in red ink.

This stores credit memorandum is of as much importance in the handling of stores as is the requisition, these two kinds of forms constituting the debits and credits in so far as general stores-keeping and the factory are concerned. For example, if 100 bolts are drawn out of general stores for a production order and 10 of them are found defective, 10 more bolts will be drawn out on another requisition accompanied by a credit memorandum for 10 bolts, and the

10 bolts drawn out on the second requisition will be charged off by the record clerk to either "Scrap" or "Defective Pieces," so that by this means the balance of his stores record sheets will always check his stock, and at the same time dispose of any defective material.

Again, the tool room might draw out on requisition a dozen 12″ flat files. Immediately afterwards another foreman might present a requisition for these files, and, there not being any in stock, he might be given six of the files that had been taken out by the tool room. In such case the six files would be passed back into general stores from the tool room by a credit memorandum, and the requisition from the other foreman changed to six and turned into stores; thus leaving six files charged to each department. It must be borne in mind, however, that these transactions must not take place between departments, but through the stores department as a clearing house.

These stores requisitions and credit memoranda can both be used in conjunction with component stores in the same way as they are with general stores, if desired, but it is much better to use for this purpose a combined form headed "Component Stores Requisition and Credit" but otherwise bearing the same data.

CHAPTER V

COMPONENT AND FINISHED STORES

Showing how they differ from general stores both in character and their method of record; together with a discussion of their inventoried values, their control, and their relation to accounting.

CHAPTER V

COMPONENT AND FINISHED STORES

Nature of Component and Finished Stores

When material is issued to the factory for the manufacture of pieces or parts, it is charged to a production order covering same; and the amount of material, as well as the labor on this production order, is charged up to a controlling account called "Work in Progress," where it remains until the entire production order is completed. When the production order is finished, "Work in Progress" account is credited, and "Component Stores" is charged. Here the item remains in inventory as "Component Stores" until withdrawn again for assembling, where it will be charged against "Work in Progress" until this assembling production order is completed, when "Work in Progress" will again be credited and "Finished Stores" charged. Here it will remain until sold, when "Finished Stores" will be credited and "Sales" charged. In this way the controlling accounts give the summaries of perpetual inventories, as it can readily be seen that at the end of the month any uncompleted orders must necessarily be in "Work in Progress" and all completed orders must be in either Component or Finished Stores.

Now, it should be borne in mind that no items other than those processed by the factory itself should be included in the classification of "Component Stores" or "Finished Stores," for if this is done there is no check on inventory records as related to production orders, or no distribution

of a proper amount of overhead to production orders. Therefore, it is worth while to say again that such things as screws, nails, bolts, wire, or any finished parts bought outside, do not, under any circumstances, become identified with component or finished stores records; they are simply "General Stores." Even if parts for a unit or model of any kind should be bought, they would be general stores until drawn into the factory by some production order, which would convert them into "Work in Progress."

Component Stores

Component stores do not include any component parts or pieces in progress, and, until a piece or part is finished, it is still "Work in Progress." When, however, this piece or part is finished and in such shape as to be carried in stock for assembling purposes, it then becomes "Component Stores." Therefore, these component stores bear no relation to general stores or to finished stores, simply being a necessary transformation convenience in accounting for factory operations. Component stores should be directly in charge of the production department and be replenished and drawn on in accordance with instructions issued by this department to the factory for making up finished units or models as called for by some schedule or schedules.

As component stores are the result of having processed certain pieces and parts on some particular production order, they must be costed out on a separate production order in order to get the final cost of the different units in which they may be used.

This method of procedure is carried still further for the reason that costs must be divided not only into units, but into parts of units; and parts, into pieces and operations on these pieces and parts. Therefore, a manufacturing order calling for the production of any given unit or number of

units is converted into production orders for the various parts and pieces required.

The principal reason for this procedure is on account of sub-assembly; one example of which might be the lock mechanism of a rifle. This is composed of a certain number of pieces, which, when assembled into the lock mechanism, constitute a unit, inasmuch as it can be assembled and become operative independent of the model upon which it goes and, under certain circumstances, may be used on several models of rifles. Therefore, the pieces that make up this part should be assembled into it under a production order for assembling separate from the one covering the general assembly of rifles.

Component Stores Record

The "Component Stores Record" (Form 13) is to component stores exactly what the "General Stores Record" is to general stores; viz., a record of all pieces and parts processed in a factory, taken into stores, and then delivered to assembly orders. It shows also inventory values of component stores whenever it is necessary to have such information. The entries in the component stores record are similar to those found in the general stores record, and likewise are governed to a certain extent by maximum and minimum amounts.

To illustrate this point, if a sales department were requiring, say, 30 engines a day of a particular model, the minimum inventory of that engine in finished stores would be determined by whatever length of time it takes the factory to assemble that kind of an engine. If this time were 10 days, the minimum inventory on finished stores would be 300 engines.

To go a step further, if four of a particular piece were required to an engine and 30 days were necessary to get

the piece through the factory, then the minimum in component stores would be four times 30 for each day, and for 30 days, 30 times this number, or 3,600 pieces. This same comparison would apply to all articles of manufacture, such as rifles or similar weapons, wherein a complete model is composed of an assembly of several parts, some of which are duplicate parts.

When any finished pieces or parts are received in stores from "Work in Progress" in the factory, they should always be accompanied by a tracing tag, showing production order number, lot number, and net quantity received. As soon as it is received by the stores keeper, he should enter on this tracing tag the actual count of the goods received, date, and sign same, and then turn it over to the stores recorder who will immediately post to his stores record under "Received" the quantity specified, with the order number upon which it has been made.

This material will usually be received in the stores as only a part of some production order; that is to say, there may be a production order in the factory for 10,000 pieces, and these may come into component stores in lots of 2,000 or 3,000. The entries for such receipts must be made in the column captioned "Received on Unfinished Order," for the reason that goods received in instalments in this way have not as yet been costed out, and consequently must be held in this column until the cost is known, which will be upon the completion of the production order.

When pieces on uncompleted orders are entered in the column "Received on Unfinished Orders," the quantity is also added to the balance in the column headed "Balance on Hand—Unfinished Orders," given on the outside. It may be that several instalments of finished parts or units will be received into component stores before the entire order is completed; but, as soon as the total order and cost

of the order is received, the total quantity made on the order is extended to the column "On Hand—Component Stores," and the cost price is entered as above.

When the stores recorder receives a requisition calling for component stores and these have been delivered, he will enter in the "Issued" column the date of issue, order number for which the material is to be used, together with the quantity. The amount is then extended to "Balance on Hand—Component Stores" and the inventory value is then carried out at once.

In the event of its being necessary to give out component stores that have been received on an unfinished order, the order number and the quantity are entered in exactly the same manner as above, and the quantity is deducted from the "Balance on Unfinished Orders," as there is no balance in "Component Stores"; for, as stated above, although the goods may be received into the component stores department in instalments from some production order, they cannot become "Component Stores" as a matter of record, but will remain "Work in Progress" until the costs are ascertained and closed out.

It may be necessary at times to draw from both "Balance in Component Stores" and "Balance on Unfinished Orders." To illustrate this, suppose a requisition calls for 3,000 parts and there are 1,000 parts in "Balance in Component Stores," while there are 4,000 in "Balance on Unfinished Orders." Obviously, all there are of component stores, which is 1,000, will be taken, and the difference must come out of the "Balance on Unfinished Orders"; and, if it becomes necessary to price all that are drawn out, the price for the number taken from the "Balance on Unfinished Orders" must be the last cost price, but this should never be resorted to except for special purposes.

When costs of any parts which are carried in "Balance

on Unfinished Orders" are received, the quantity should then be transferred to "Balance in Component Stores," together with unit prices, total values, etc.

Controlling Account for Component Stores

In the controlling accounts of a company, there should be an account which governs "Component Stores"; and the aggregate inventory value, as shown by the component stores record, should at any time practically agree with the controlling account, from which it will be noted that a check is thus kept on the inventory from two separate and independent sources.

In first establishing any such inventory, conditions may be met which will make it almost prohibitive to maintain a minimum inventory on account of the demand for parts for assembling purposes. Therefore, it may become necessary to draw a large part of assembling requirements from component stores on unfinished orders.

In order to maintain a controlling account properly, and have the monthly balance sheet a true interpretation of inventory conditions governing component stores, the stores recorder, at the end of each month, should draw off from his records all parts issued from stores on unfinished orders and enter the same on the component stores record in red ink under the column "Balance on Hand—Component Stores." This red ink balance will indicate a delivery to component stores, which, in so far as regular records are concerned, is not yet recorded as received in component stores, and will not be so recorded until the entire production order is completed. The stores recorder should also draw off, at the end of each month, all finished stores issued as unfinished orders. A memorandum entry should in both cases be shown in red ink on the monthly balance sheets, but must not be actually entered on the balance sheets of private

ledger accounts, as would be the case where a production order was completed and the entire cost charged to stores and credited to "Work in Progress."

The purpose here is to create temporarily a credit to "Work in Progress" of such items as have been used in some other form of inventory. Otherwise, any units finished on an uncompleted assembly production order that were sold and shipped would still be in the "Work in Progress" inventory, and also in the accounts receivable, thus creating double value on inventory as a whole for such items.

What has been said above as regards unfinished balance, is absolutely necessary in connection with the keeping of finished stores; but in connection with component stores, the regular form of general stores record could be used, by sacrificing accuracy and always using last cost price obtained on issue of any component stores, making a new price whenever a production order was closed out.

Finished Stores Record

The keeping of this record (Form 14) is identical with that of component stores, inasmuch as all the receipts from production orders are entered in the "Received" column, and everything given out on a shipping order (instead of a requisition or a production order) is entered under "Issued."

In the issuing of shipping orders, two copies should always be given to the shipping clerk, one a shipping memorandum, returnable to the accounting department for billing, and the other a shipping memorandum to accompany the shipment to the consignee. These are the only papers he should have for the shipment of goods.

On the shipping memorandum returnable to the accounting department, provision should be made for the entry of the cost of all the items shipped on finished stores, as these figures are necessary for making a sales analysis.

CHAPTER VI

STORES—SPECIAL FEATURES

Illustrating forms to be used as a check on materials drawn against orders, and explaining in detail the stores keeper's responsibilities in ordering goods made in the factory, and his procedure in disposing of returned goods.

CHAPTER VI

STORES—SPECIAL FEATURES

Assembly Requisition

Two forms should be provided for requisitioning material for assembly purposes. One, a blue sheet, for the total list of material required to cover specified lots on a given production order, will be filled in, in the first two columns only, showing the number of pieces or parts required, and the piece or part number, together with the date and production order or lot number at the top. (See Form 15.)

The assembly requisition, filled in as described, is turned over to the stores keeper, who immediately proceeds to fill the requisition. Owing to low balances on hand in stores, however, he may frequently be unable to make complete delivery of all the parts called for. Therefore, the duplicate of the assembly requisition, a pink copy, has been provided to take care of these "Shorts." As soon as the stores keeper gets out and delivers to the department requiring it, what material is available, he enters under "Delivery" on the blue sheet the date and quantity delivered. When the sheet or sheets covered by this requisition are thus filled out, the stores keeper transfers to the pink sheet the quantities of each part still undelivered, as shown by the blue sheet.

The following day, the pink sheet is gone over, the items which are undelivered balanced, if possible, and delivered; any quantity so delivered will be entered on the right side of the requisition, and the balance still unfilled will be transferred to another pink sheet for the third day. This will be carried on from sheet to sheet, from day to day, until the

total assembly requisition has been completed. In this way, the stores keeper is made responsible for looking after the complete filling of the requisition after it has once been given to him in its entirety.

The reason for this procedure is that all requisitions must be turned in to the record clerk each day, so that the stores account may be kept up to date, and the distributions made to production orders and departments, and not held up until the full amounts of various parts have been delivered.

Production Order Distribution of Material

The production order distribution of material (Form 16) is a new form which has been provided to take care of the distribution of material to both production orders and departments, and also to give a daily check on the additional amount of material allowable to be drawn on any production order.

The clerk who has charge of the record should work alongside the clerk in charge of the general and component stores records in the handling and posting of requisitions coming into the stores keeper's office. These two clerks should handle them jointly, as described hereafter. A production order distribution of material sheet, or sheets, should be opened for each production order number, and should then be filed in a binder in the order of issue. The stores clerk is provided with a complete set of pieces, parts, and unit key cards, which show in detail the kinds and quantity of material required to make any one piece, part, or unit.

As soon as the stores keeper receives his copy of a production order from the planning department, the production record clerk immediately opens up a sheet for this production order number, showing the quantity required, piece

number, and order number. He then turns to his key cards and ascertains the amount of material required per piece, and opens up a column on this distribution sheet for each kind or size of material required to manufacture the item called for, inserting the name of the material, the total requirements for the production order, etc., and he is then ready to receive requisitions against the production order. No material whatever should be delivered until the stores keeper's copy of the production order has been received, and this production order material distribution sheet has been opened.

This production order distribution sheet will also answer for the distribution of material to departments, thus saving the entire time previously taken in the posting of requisitions to departments separate from the production order. This combination of posting to production orders and departments will be accomplished in the following manner:

When the first requisition for material chargeable to a production order comes in and is posted on this production order material sheet, the department which draws the material should be entered just above the words "General" or "Semi-Finished Stores" (which is the same as "Component Stores"), the classification of material showing just below. As each kind of material on any production order will always be drawn by the same department, the monthly total of the material drawn, in any one column, may be recapitulated from that column to the "Recapitulation of Material to Department." Thus the posting to production orders will be all that is necessary to get a departmental distribution as well as the classification of material used by each department.

Moreover, it will not be necessary to figure the extension of the individual requisitions going through, which will save a great deal of time. This will be properly taken care of by

the footing of these pages at the end of the month, when closing the production order for posting to the production and betterment order record; that is, the unit price will be shown for each requisition drawn, but the extension is made on the monthly total drawn instead of on each individual requisition.

These last two features, the combining of the departmental and classification of material posting on the same sheet with the production order distribution, and the extending of the requisitions only by the monthly total drawn, will prove a great saving of time in the handling of this record. Of course, if the unit price shows any change, it may require two or more different extensions for the month, but, as a usual thing, the unit price will be the same during any one month.

Assembly Production Order Material Distribution

The "Assembly Production Order Material Distribution" form has been provided to take care of the distribution of material on assembly production orders in a way similar to that in which the production order distribution takes care of the distribution of material on production orders for pieces and parts. (See Form 17.)

At the time a production order is issued by the schedule clerk and a lot is started, this sheet will be typewritten from the unit key cards by the order department, it being a carbon of the assembly requisition. This sheet shows the production order number and the department number drawing the material, the quantity required, part or unit number, and part or unit name. At the time this sheet is made out, the first two columns only are filled in, showing the number of pieces required of each piece or part, and the piece or part number; it thus constitutes a bill of material for the lot specified on the production order. As soon as this is made

out, the original copy, being a requisition, is forwarded to the foreman of the department who turns it over to the stores keeper as soon as he is ready to receive the material. The assembly sheet is turned over to the distribution clerk in the stores keeper's office, who inserts it in his binder of material distribution as an authorization to deliver the quantity of goods specified. As assembly requisitions and the "Short" list of the same are turned in daily by the stores keeper, the items delivered on them are posted into the four "Delivered" columns on this sheet, each time showing "Date," "Quantity Delivered," and "Unit Price"; this entry being made at the same time that the stores record clerk makes the credit entry on the stores record, giving the distribution clerk the unit price.

The extensions are not made on these individual deliveries, as this is unnecessary, the assembly production order material distribution sheet being the first and final distribution of this material, both to department and production order. The unit price is provided in each column to cover cases where it may have been changed during the life of the production order.

When the total pieces on any part are delivered, the total quantity will be extended in the "Total Quantity" column, and the extension made and entered in the "Total Amount" column, and the material classification entered in the last column. As soon as the production order is completed, this form will be closed out and filed in the finished order binder, after having been extended, and the totals inserted on the copy of the production order, which is turned in to the distribution department.

Extensions

All extensions on the material issued on production orders should be made by means of a mechanical calculator

at the time the production order is completed, thus saving the time of the clerk, who posts only the quantities, and greatly expediting the work of closing up production orders, as well as saving a large amount of time in handling the distribution of the requisitions through not extending each individual requisition.

Daily Report of Stores Balance

The stores record clerk should draw off, at the close of each day, a recapitulation of the balances on hand of all manufacturing materials in general stores, and of all semi-finished and finished stores. This balance sheet must be made out in triplicate, one copy being sent to the works manager, one copy to the purchasing agent, and one copy to the planning and production department. Eventually, when these daily balance sheets become thoroughly regulated, the use of the stores clerk's order described below may be done away with; for this balance sheet in the hands of the planning department, together with the report of finished parts received in stores, from tracing tags, will provide full information as to starting operations for the manufacture of the parts nearing minimum, so that the reaching minimum will be readily anticipated, and the customary procedure of crying "Short" will become a thing of the past.

Objects of Stores-Keeping

From the foregoing it can easily be seen that four great objects in keeping stores are:

1. To maintain a perpetual inventory.
2. To prevent the use of material without its being accounted for, or without authorization.
3. To prevent unnecessary investment in material, by a

proper specifying of maximum and minimum amounts.

4. The manufacture of materials on a balance schedule basis in an economical manner, by the working together of the order and stores departments.

Stores Keeper's Order

As the stores keeper has full control of maximum and minimum amounts in stores, the responsibility is his, of course, for maintaining these amounts. In case of general stores, where the stock is bought, he should make out a regular requisition for purchase; but in the case of component stores or finished stores, where any maximum or minimum amounts have been established, he should use a stores clerk's order, as a requisition to have such parts made up; and as the maximum amount for any item is an authority for the manufacturing of such items when it is brought down to minimum, the stores clerk's order to manufacture will be turned over to the order clerk for his guidance in starting the work on the parts required.

This order (Form 18) is made out in duplicate by the stores clerk; one copy remains with him, and the other goes to the schedule clerk in the production department. As soon as this is received, it will be handled by him in exactly the same way as any other production order, by the issuing of the necessary production order for the manufacture of the item in accordance with the production order method in use.

The rule governing the issuance of these orders by the stores clerk is that he should never issue an order (except in special instances) until the stock is reduced to the minimum, and the "Amount on Hand" must always be shown opposite the space provided for in the stores clerk's order. One order may cover several different items, but each item

must be covered by a separate production order on the part of the production department.

Goods Returned Memorandum

Goods that have been sent out of a factory and returned, cannot be taken back into stock until some special consideration has been given them. Therefore, for this purpose, a "Goods Returned to Us Memorandum" (Form 19) has been designed on which may be entered the receipt of all goods of any nature whatsoever that are returned, whether they are returned for repairs, non-acceptance, or for any other reason.

This form is made out in triplicate; the white copy is kept by the receiving clerk; the second copy (pink) is immediately sent to the stores department; and the third copy (blue) is sent to the sales department. As all goods returned are usually a question of sales, the sales department must first decide what is to be done with the returned goods. It will then write upon this form such instructions as its correspondence indicates is necessary, whether the returned goods are for repairs or for acceptance back into stock. If for repairs, the sales department immediately fills out one of the copies and forwards it to the order department to make the repairs, entering the repair order into sales the same as any other order. If the goods are to be taken back into stock, the copy will be so marked, and one copy of the receipt is returned to the stores keeper, who will act according to the instructions received thereon.

All information called for on this form must be filled out by the sales department and shipping department, and where a credit is to be given it must be so stated. As soon as all this information has been obtained, the third copy (blue), held by the sales department, must be signed by the manager and sent to the accounting department.

If repairs are to be made, the copy to the shop superintendent means that a production order must be made out to cover the repairs; and whether it is for a customer or to go into stock must be clearly indicated.

In other words, the whole question of returned goods is, first, if they are returned for repairs to be made on them for the benefit of the customer, they must be handled by the sales department, as this is either a question of sales or a question of making good some previous sale. On the other hand, if they are returned because they are rejected, it is a question of sales cancellation to be followed by instructions for disposition. In either case, one of two things must take place: either they must be repaired to be put into perfect salable condition again through a production order for repairs for this particular item, or else they must go into stock as finished stores, the original instructions for which must emanate from the sales department.

Accounting for Goods Returned

Returned goods, in this instance, means something which the company has manufactured and has previously sent out, and which has been returned for some one of many different causes.

The goods may be returned because they are unsatisfactory to the customer, perhaps as to quality, perhaps as to time of delivery, or for other reasons. The nature of the return from the customer will affect the accounting. If the goods are not in shape to go back into stock, certain repairs must be made so as to put them into shape in order to get them back in stock. Now, it is obvious that such repairs cannot be charged as an additional cost to the goods; it is usually an expense due to bad sales, or bad selling policy, and in such case should be charged up as a sales expense, inasmuch as the goods, after being put into perfect

repair, must go into finished stores at the same price as other items of the same nature. Any losses due to the dissatisfied customer will then, nine times out of ten, be a direct charge to the selling department, and not to the factory or to goods made by the factory, unless they are defective by manufacture.

This same rule also applies in cases where the sales department issues orders to have manufactured certain types of product, as for instance, engines, and for certain sales or credit reasons these orders are cancelled or returned, and these special types of engines have to be made over into other types. The expense of rebuilding these engines cannot be considered as an additional cost to the goods, being due to bad sales or credit policies, and must be charged up as a commercial expense.

Again, goods are returned to be repaired for a customer, which, in a motorcycle department, is quite a general thing, and, as the number of machines put out grows, this work also grows rapidly in proportion. In such cases, an order must be made out to have each particular article repaired, followed by a production order for use in the factory, so that all labor and material for making the repairs will be charged up to the original item, in addition to which must be charged the prorated amount of general overhead.

Other complications that come into this accounting are in the nature of such repairs as cannot be done in the factory itself, but must be sent out for the customer. In such cases the article may be sent back to the factory, or shipped direct by the customer to the place where it is to be repaired, for all of which, special provisions must be made, but not primarily as is often done in the cost department.

CHAPTER VII

PREPARATION FOR THE HANDLING OF PRODUCTION

Illustrating and describing in detail the necessary classification of pieces, parts, and units, and their relation to stores, schedules, etc.

CHAPTER VII

PREPARATION FOR THE HANDLING OF PRODUCTION

General Considerations

In the next few chapters the preparation necessary for handling production on a more or less scientific basis will be described in considerable detail. In no other way could the relation between works management and correct accounting methods and its dependency on them be shown so well. It also shows how low costs of production may be obtained and maintained.

To express the whole matter briefly, the real purpose of any manufacturing concern should be to get out of investment, labor, and material all that can be obtained therefrom in the shape of product. The few chapters devoted to the handling of product are brought in to show its close relationship to accountancy and the dependency of the one on the other for economical results. If it were not for this consideration, questions of shop practice would not enter into a work of this character at all.

Analysis of Production Handling

The work of production handling naturally resolves itself into the following divisions and order of arrangement:

1. A standardization of the pieces, parts, units, and models to be manufactured, their relation one to another, and the materials required for each.

2. A standardization of the operations and rotation of operation on all pieces, parts, units, models, etc.
3. The standardizing and indexing of all dies, jigs, fixtures, gages, etc., required for same.
4. A balancing and grouping of the machine tool equipment so as to show the pieces and operations possible on each machine or group of machines.
5. The tabulating of pieces and operations that it is possible to do on each different type of machine tool.
6. The making of time studies on all of the operations of each piece, and the allotting to same of a standard time for doing the work on each operation; this time to be the *basis* for premium or piecework rates and for possible plant output.
7. The scheduling of sales requirements for the season's output, and from this, scheduling the manufacturing requirements on a parts balance basis so as to maintain a full complement of parts and pieces required for assembling.
8. The developing and installing of a method for putting production through a factory on a parts balance schedule basis so that at all times the entire plant capacity will be under full control.

Utilizing Plant Capacity

One of the most important features in efficiency work is the ascertaining, developing, and utilizing of plant capacity to its utmost. To do this there must first be a complete tabulation of all pieces, parts, and units that are to be manufactured (with material required), and then the requirements of production handling, as outlined above, can be carried out in detail.

Having established a standard design for the pieces,

parts, and units to be made, and having made an analysis of the machine tools available, all of the operations on each of these pieces must be standardized to determine with what tools and on what machines each piece of work can be done to the best advantage. Everything is then ready for making time studies on these operations and preparing for the schedule of production. When this schedule has been laid out and the whole proposition developed and standardized, then, and not until then, may the planning of production be installed on an economical basis and as it should be carried out; thereby utilizing the entire plant capacity and meeting the predetermined manufacturing requirements as per schedules of output.

One of the great problems before manufacturers today is to discover the weak places—the points at which their plants lack capacity to manufacture the volume of product required on a balanced basis. It must be understood that full plant capacity cannot be reached until its equipment is developed to the point where time studies may be made for obtaining data on ultimate capacities. Undoubtedly, there can be an approximate *estimate* of what the capacity *will* be, based on the manufacturer's machine tool rates of output, but in most lines of work such estimates have been found, in the ultimate analysis of time studies, so erroneous as to necessitate a complete change in the whole organization of the plant.

It would seem that no more profitable work could be done in any plant than to establish for a while a pace-making department for all pieces and parts to be manufactured. This should be done in order to obtain machine capacity, man capacity, plant capacity, and time limits, with a rate-setting based upon these. It also enables the determination of the necessary operations with rotations of same.

The compiling of data from which this information may

be obtained is most valuable work, as it shows not only the points which need building up in equipment, but also, if additional equipment is not put in, what finished or partly finished parts must be bought outside, in order to let the departments of greater capacity work up to their maximum.

The condition of any plant in which this work is undertaken is usually such as to require considerable time for the compiling and analyzing of the complete data of its capacity, but when once this is done, the manufacturer will have a control of production which very few executives enjoy today. Although the executive control which this standardization work gives is very desirable and necessary, the prime reason for such standardization is to obtain a radical reduction in the costs of manufacture, due first to the greatly increased efficiency of the plant from a machine point of view, and second, to the very material increase of output which can be obtained from the plant with less expenditure for labor.

Production and the Sales Department

In order to manufacture economically it is necessary to put the entire production of a factory on a schedule basis, by first determining what the sales requirements will be for a manufacturing year or season. It is also vitally essential for economical manufacture that these schedules be made to *protect manufacturing conditions.*

It is a common practice with many manufacturers today to run the manufacturing end of their business to suit the sales end; so much so that when special features are desired by the sales department, the factory immediately proceeds to furnish them. What is needed above all else is to develop and introduce "parts common to all" practice, and, having furnished the selling end with standard articles which the trade requires, it is up to the sales force to sell these articles

and not make the factory its tool in catering to the whims of individual customers.

In most scrap piles today there are many thousands of dollars' worth of pieces and parts which have been scrapped because they were made up as special features to suit individual customers with apparent disregard of the amount to be ultimately used. As a result, when the particular customer's orders came to a stop, there was on hand a large number of these special parts which the selling department was unable to sell and which could therefore only be scrapped.

In other instances, large amounts of scrap have been produced by adopting new designs for certain pieces and parts with absolute disregard of the quantity of old pieces and parts on hand at the time of their adoption. Obviously, this should be avoided.

Schedule of Production

While, of course, manufacturing schedules must be made out in accordance with the sales requirements as a whole and the ability of the sales department to dispose of the product, these matters must be gone over in advance and the production schedule made up in accordance and with regard to factory capacity. Then, with this schedule at the maximum, all new features should be reserved for the following season's models and special features eliminated to the greatest extent possible.

It is obvious that before scheduling of production can be carried out with any efficiency, it is necessary to know exactly what there is with which to turn out production, and to have proper methods laid out for performing the operations required. It has been found in many cases, by actual observation, that one operation is often done in half a dozen different ways, each one more or less extravagant in the

method of handling the material and labor involved. It is, therefore, essential that there should be established standard methods for the manufacture of each article, and instructions be on record as to how and in what rotation the various operations should be performed. The accuracy of the work depends largely upon its being done in the proper rotation. Theoretically this should not be so, but in practice a considerable amount of scrap is accumulated in many plants because of operations being put through in wrong succession.

To meet this condition, the first consideration is the tabulating of articles to be made, for which there have been provided "Piece Key Cards," "Part Key Cards," and "Unit Key Cards" (Forms 20-22). Too much care cannot be given to this all-important starting work, for upon the correctness of the information on the piece, part, and unit key cards depends the efficiency of the work of the purchasing department, the stores keeper, the production department, and the cost accounting department. The division of any unit into pieces or parts by operations should be done in the drafting room and shown on the drawings and bills of material going therefrom, and each piece or part of any unit to be manufactured must be given a number to distinguish it from all of the other parts and pieces.

System of Numbering

There are a number of short-cut methods of joining and classifying the numbers of units, pieces, and parts, keying all pieces and parts into their respective units. In most factories, however, pieces and parts are already numbered, and where drawings of these pieces and parts are correlated it would not always be practicable to change the numbers, especially where repair parts have been catalogued by number.

In the numbering of articles manufactured, an effort should be made to give group numbers; for instance, pieces, from 1 to 3000; parts, from 3000 to 5000; units, from 5000 up. Sufficient provision should be made for the various sizes of standard screws, bolts, nuts, etc., and, so far as possible, all special features should also be numbered in a group and filed separately from standard items so that a check can be kept on them, and so that they can be gone over frequently by the management. Any additions to these special features should be reported to the management from time to time. This is because of the danger of extending special features into too great a variety, and also because of the tendency on the part of the designing department and factory management to develop new features and apply them while the company has a large stock of designs on hand which should not be changed until the stock is exhausted. Each special feature, of course, will be a unit in itself and will be registered on a unit key card (Form 22), showing all the parts and pieces of which this particular unit is composed.

Provision should also be made for numbering the drawings and rough material for any finished part, so as to key on to the finished part. For example, on a gasoline engine the connecting rod may be No. 20, and is made from a drop forging. As the connecting rod finished is a component part, it goes into component stores as No. 20. The forging for this also requires a specification, and this forging and its drawing number should be No. 20–A, the "A" signifying the rough material for the finished part. However, should this connecting rod at any time be bought outside in a finished condition, it would come into general stores as No. 20, instead of No. 20–A which is its distinctive number when received as a rough forging.

As described in Chapter V, a unit is an assembly of

two or more pieces or parts into a thing which has a functioning power in itself or is in a condition for sale by itself as a complete article. Thus, a motor is a unit because it will deliver power. A transmission gear is a unit because it is a sales item. Units vary greatly in their characteristics according to the nature of the business and its sales requirements; that is, what would be a unit in one business might be only a part in another.

A part consists of an assembly of two or more pieces, being in itself, as distinguished from a unit, devoid of any functioning power or sales possibilities (except as repairs), until connected or associated with some other parts and pieces.

A piece is distinguished from a unit and a part as being inactive and inoperative; at the same time it is individual in its character.

Thus, an automobile engine would be a unit; the fan, water pump, etc., would be parts; while the fan blades, screws, bolts, crank shaft, cam shaft, etc., etc., would be pieces.

A part should be such an assembly of pieces as can and will be made up and put into component stores ready to be drawn out and assembled into a complete engine with other parts and pieces. It should be noted that it is possible for large and primary units to be composed of several smaller or secondary units as well as parts and pieces. Thus, a tractor, which would be a unit, would include a secondary unit, the engine, besides the various parts, such as frames, wheels, etc., and the separate pieces, such as screws, nuts, bolts, etc.

Piece Key Card

This card is written up for each piece, and, as will be noted in Form 20, shows the piece name and number, draw-

ing number, pattern number, the size of the lot to be put through, dimensions of the stock from which it is to be cut, kind of material used, and amount of material required for one piece or one hundred, the average weight, rough or finished, the average weight of scrap produced, and the pieces for which waste cuts can be used. It also gives the name and letter of the operation or operations, the machine and department in which the work is to be done, and a list of the parts and units using this piece.

If a piece is to be used only for an assembly into parts, the number of pieces required for each part and the part number will be shown in the column "Used on Sub-Assembly"; and the total number used on each unit is extended in the column, "Used on Units." For example, four of piece 1000 may be required on part 3500, and then in turn, four of part 3500 are required on unit 5000. Therefore, the card will read: "4 used on part 3500"; "16 used on unit 5000." If, however, these pieces are used exclusively in the final assembly of a unit, without previously having been assembled into a part, they will be entered in the column, "Used on Final Assembly," thus meaning that they are attached to certain pieces on the final assembly. That is, piece 1550 may be used only for the final assembly; one will be attached to piece 1600, two to piece 1601, and three to 1602, all entered in this column; and then, in the column "Total Used on Units" will be entered, "6 used on unit 5001."

It is possible that a piece may be attached to different pieces on different units, in which case the pieces to which it is attached will be bracketed, showing the unit to which they apply. It may also occur that a certain piece may be used on an assembly into a part and required also for use on the final assembly of these parts into a unit. This should then be entered on the card as follows:

"4 used on part 3000 (four parts used on the unit); 2 assembled to piece 50; 3 assembled to piece 65" (making a total of 21, used on unit 5002).

The complete file of piece key cards must also contain for each particular complete unit manufactured a separate card for each piece bought, and these cards should be stamped "Bought" with a rubber stamp, so that the storeskeeper can immediately know that such a piece is bought in the open market and not made in the factory. In case certain pieces which are usually manufactured are occasionally bought, the cards for these will not be marked in this way, but they will be shown in the Stores account as "Pieces Ready for Assembling" and not as "Raw Material" with the letter "A" following.

These cards are, as the name implies, used to furnish a key to the materials and operations required to produce some piece or part of any given unit, together with information as to the different units on which the piece or part may be used, and the different parts on which the pieces are required.

Part Key Card

This card (Form 21) furnishes a complete list of the pieces which may be drawn from stores and assembled into parts which in their turn may be used for the final assembly of a unit. It gives the part name and number, as well as drawing number, and size of lot best handled through all operations, and it shows the various unit numbers on which this part will be used, and the number of parts required on each of these units. It also contains the number and name of each of the operations of assembling. The operation should be designated by a letter instead of a figure, as operations carry letters, and rotations on the operation, numbers;

and as the operation letter serves also as a key on the workman's production ticket, the use of a figure would be confusing. The card should show the department in which each operation is done, and the piece numbers and the number of pieces required.

After the pieces going into the part have been ascertained, they should be entered on the part key card on the blank line following the name of the operation, as operation "A," that is, the first line should show the operation number and name, and on the right half of the card should be entered, on the same and following lines if necessary, the pieces required in the work of this operation. Operation "B" should then be entered on the left side of the card, on the line following the entry of the last piece required for operation "A." Then will come, on the right-hand side of the card, any additional pieces required by the workman to complete operation "B," "C," "D," etc., thus giving a history of all operations (which are taken from operation study card, described in Chapter VIII).

Unit Key Card

The unit key card (Form 22) has been provided to give a complete list of the pieces and parts required for the assembly of each unit. The unit number and name are given, as well as the drawing number of the unit, the number of cards comprising the list for this unit, and the number of each card of the group. The operation number and name, and the pieces and parts required, as well as the department in which each operation is performed, are entered on the card, the same as on the part key cards, thus showing a complete list of all parts and all separate pieces which are required for the final assembly of the unit. The parts should be grouped on the card and should be specified as parts, and the pieces as pieces.

Preparation and Care of Cards

The piece, part, and unit key cards should be made out by the chief draftsman, and one of his assistants should be delegated to keep all sets of key cards up to date, making, under the chief draftsman's instructions, any changes that may become necessary. One set of these cards should be held in the drafting room by the chief draftsman, filed in rotation by the piece, part, or unit number. Two additional sets should be made; one for the stores clerk and one for the purchasing agent. Each of these sets should be written in different colored ink, so that one set may be readily distinguished from another, and any transposition from one file to another detected. The chief draftsman should approve both the master set and the other sets as made out. None of the entries on these cards should ever be changed, or substitutions made, except by the chief draftsman or his clerk.

These additional sets of cards should be filed in rotation, according to number, the same as the chief draftsman's set, but in case at any future time a numbering system of pieces and parts is introduced which will key these pieces into parts and units by the numbers given them, then these additional sets of cards and an additional set for the chief draftsman also, should be filed with the part and unit cards as guides to the piece cards. That is, a unit card will be placed in the file, and behind that, the first part card which will be required; behind this part card will be all the pieces going to make up this part; behind these will be the next part card with all the pieces going to make up this part, and so on. Behind the last of the part cards will be filed the individual pieces used on assembly for this unit. In this same manner all the other unit key cards, together with their various part and piece key cards, will be put into the file.

Uses to Which Key Cards Are Applied

From key cards the following data are obtained in the handling of production:

1. A list of pieces and parts to be manufactured, for the information of the production department in making its study of machine capacity, operations, and time.
2. Information for the purchasing department in making up a purchase schedule for the year, showing quantities and date of delivery at intervals during the year to anticipate the requirements of the manufacturing schedule.
3. Information for the purchasing agent as to what pattern is required to be sent to the foundry for casting any specified piece or part.
4. Information to enable the stores keeper to make up his purchase requisitions for material, as regards kind, quantity, and quality, and to order in such lengths and widths as will most economically cut to the size required.
5. Information for the schedule department as to the number and name of operations required to process each specified piece, or to assemble each part and unit; the department in which the work is to be done; and the character of the machine on which the work is to be performed, so that it can fill in the tracing tag which goes to the plant with the production order for the first operation.
6. Information for the schedule department as to the amount and kind of material required, so that the requisition for material can be made out and sent to the department with the tracing tag and production order for the first operation.

Drawing and Tracing Card

Before a bill of material can be made up and a system for handling work through the factory established, it is necessary to have a proper method of classifying the handling of drawings, blue-prints, and also patterns; otherwise the piece and part key cards cannot contain the full information called for. This need is met by a "Drawing and Tracing Card" (Form 23), which is used in the drafting room, not only as an index to all drawings, but also as a record of all costs of making the drawings, whether in pencil or ink, as a sketch, or for final tracing. The cost of making drawings should be obtained in the same way as the cost of anything else, that is, by the use of the workman's time ticket and requisition for material.

The chief draftsman should have a set of distribution ledger sheets, as described in Chapter XII, and should give an order number to each drawing or set of drawings made. He should enter this number on the distribution ledger and charge against it all of the labor and material used to complete the drawing, the total of which should be placed on the drawing and tracing card. In addition to this, the card will show the disposition of the drawing after it is completed, that is, under what file or number in the cabinet it is kept, or what use may be made of it otherwise. On the back of the card will be entered from year to year, the value of the drawing, this constituting a perpetual inventory of the same. As soon as any drawing becomes obsolete or is cancelled, the card must have "Cancelled" written across its face, together with the date of cancellation, but the card must not, under any circumstances, be removed from the file.

The drawing and tracing card can also be used for recording negatives from which photographs are made, in exactly the same way as it is used for recording drawings,

but these records of negatives should be kept in a file by themselves.

In making up a file for the drawing and tracing cards, it is only necessary to file them serially; that is, to give each card a number, and file it according to that number. If the number is known, it is easy to locate the drawing by this number. In case it is different from the piece or part number, the drawing number can easily be found on the piece or part key card, so that there is no necessity for filing the drawing and tracing cards both numerically and alphabetically as is often done.

It can be readily seen that the drawing and tracing cards can be easily located under such a file, whether they pertain to drawings of an individual piece or part, or to drawings of an assembly of parts, as each unit card also contains the drawing number calling for the assembly thereof.

Pattern Record Card

The pattern record card (Form 24) is used for making a complete record of individual patterns, showing the cost of making them, and the account to which they were charged after being made.

As a general thing, patterns are an asset to a company, except where they are made for some particular customer and charged to him, or where they become a part of the work in a contract covered by some sales order number. Also, in ordering castings, making changes in designs, etc., it is necessary to have a record of the patterns used and available. Therefore, it is very necessary that correct records of patterns be made.

If a new pattern, or a pattern covering a change in design, is made in the factory, it will be made over a betterment order number, the same as any other betterment item;

while, of course, if it is made by an outside pattern maker, it goes into general stores and is issued and charged out as a plant betterment.

Great care must be taken in making pattern charges, as sometimes the pattern must be charged to some production order which is a combination of several production orders; or again, to a repair order to cover some repair or replacement, instead of a betterment order for a new pattern. If, however, it is a pattern which is to be used regularly, the record must always show the capital account number to which it is charged, this information being furnished by the accounting department. Further, the pattern record card must always show the loft number, aisle number in loft, and shelf number in aisle on which the pattern is regularly kept in storage, so that, when taken out and sent to the foundry, it will always be put in its proper place on its return.

In commencing a pattern record it is, of course, impossible to obtain all the "Pattern Data and Costs" in items as called for on the cards, the total cost only being given as taken from the inventory; but, in every instance, the drawing number, flask number, flask size, and follow board should be given, so that information concerning all these items will always be immediately available.

Great care should be used in writing up the pattern record at the start, if not taken from inventory, to see that all patterns owned by a company in its own plant or in other foundries are included on these cards.

In filing the pattern record cards, there must be, of course, a set filed numerically, according to the number of the pattern.

Separate cards should be made out for the patterns of special tools and jigs, and these are also filed by the key number, which identifies the pattern with the piece or part for which it is to be used; the patterns being numbered

1, 2, 3, etc., when used on the same jig. As the jigs are numbered according to the part number requiring same, with a letter added—"A," "B," "C," etc.—the second pattern number for the second tool for part No. 1500 will be No. 1500–B2.

Pattern Location Card

In order to keep a record of the location of patterns when they have been taken out of the regular place of storage, it is necessary to provide "Pattern Location Cards" (Form 25), on which will be placed the number of the pattern, date on which it was sent out, and the concern to which it was sent. This card must be placed immediately back of the regular pattern record card. It can be used for a long period of time, inasmuch as it is a running record. For instance, the pattern may be sent on a certain date to a certain factory, and the date and name of factory are entered on the card. When the pattern comes back, the date is put on the card, and "Pattern Loft" is marked under "Location," which means that the pattern is in its regular place of storage. When it is sent out again, the information necessary to locate it is placed on the same card, and so on until the last line of the card is used up, so that at a glance it may always be known where the particular pattern is located.

CHAPTER VIII

ANALYZING AND GROUPING MACHINE TOOL EQUIPMENT

A description of the methods employed in measuring up plant capacity and in obtaining a balance on equipment and men.

CHAPTER VIII

ANALYZING AND GROUPING MACHINE TOOL EQUIPMENT

Machine Study Card

In making a study and analysis of the machinery and tools available for manufacturing a complete product, the first step is to make up a list of all the machines in the plant, group or chart them by size, capacities, and possibilities, and, after this is done, make an analysis of the pieces and parts and operations possible on these groups of machines. For this purpose the "Machine Study Card" (Form 26), has been provided.

On this card is to be entered an analysis of all the machines available for manufacturing purposes. In the first place, it will be necessary to number and classify all the machines in the factory. They should be numbered from 1 up, thus avoiding duplication of numbers, but they should also have as a prefix to this number, the initial or initials of the particular kind of machine, for instance, "D. P." for drill press, "P. P." for punch press, "S. M." for screw machine, etc.

The machines having been numbered and lettered in this manner, should be grouped as to kinds, capacities, sizes, equipments, etc.; machines of the same classification which are capable of the same kind of work being put in a group, so that drill presses of one size and kind will be in one group, and those of other sizes or kinds will be in other groups by themselves. Each group of machines should be lettered in

addition to the initials of the machine which forms the basis of classification; thus, drill presses would be designated as "D. P. – a," "D. P. – b," "D. P. – c," etc. When giving the full description of these machines, the factory number of the machine should also be given; but for handling production, the initial and group letter will be all that is necessary.

After this grouping has been done, all the machines of each group should be put on one machine study card, and a separate card made out for each individual machine not in a group. The machine study card will show the type and numbers of the machines in the group, the make, the size, and serial numbers, as well as the horse power required; also the location in the plant, by building, section, and department. The date and card number will also be shown, and later the original cost can be inserted if desired, so that in any consideration of the work which is done on any machine, reference can be made to its earning capacity as compared with the investment it represents.

Machine study cards should be numbered in rotation from 1 up, so that the absence of any cards may be readily detected, as it is imperative that the set be complete when making up an analysis of plant capacity. At the top of the card will be given the number of the chart on which the machines are shown.

If later it is desired to have the information appearing on the machine study cards tabulated in concise form so that the plant capacity can be read at a glance instead of requiring the study of numerous statistical cards, the machines in each department may be illustrated by a graphic chart showing their capacities, tools for same, etc. This, however, is something which can be done later just as well and therefore need not be done at this time unless it is needed at once.

As additional machinery is installed in the plant from time to time, machine study cards should be made out for it, or, if these machines are additions to a group, the data should be inserted on the cards already made out.

Tool and Fixture Key Cards

A set of tool key cards are as necessary for the control of production as are key cards covering the products made: first, because it is necessary to know what yield a tool or a set of tools will give per grind and per life of the tool, so that replacements can be taken care of; second, so that the proper tools can be requisitioned from the tool cribs for each set-up and for every tool required for various operations; third and most important of all, so that a proper cutting edge or point may be maintained on all tools by having specifications for the amount of work each tool shall be allowed to do per grind.

The condition of the cutting edge or point of tools has more to do with both quantity and quality of work than is usually realized, and both set-up men and machine adjusters should be most carefully instructed and disciplined in the maintenance of such tools in proper condition. If this is not done, quantity and especially quality of work will be greatly lowered, as what is wanted is to have the material cleanly cut, not "pushed" out of place. For this reason it is a matter of great importance that all tools shall be properly cared for.

Unless grinding specifications, together with the specifications for depth, width, and length of cut, are carefully carried out, bad work and a failure to meet the schedule of manufacture will occur on account of the fewer pieces made and the greater rejection of those that are made, to say nothing of the destructive effect on the tools and fixtures themselves.

Tool Key Card

This card (Form 27) is designed to make a record of what a tool will do, and the condition under which it must be used, and it is highly important that all of its data be faithfully filled in. The tool is given a symbol, and, if made for any particular set-up, this must also be indicated. In addition to this, the number of the component for which the tool was designed is to be given, followed by a *description* of the operation, not an operation symbol.

In many instances the average number of pieces that a tool will make from one grind, or as a total, will have to be estimated. Careful observation of the tool in actual use, however, will provide any corrections that may be necessary on the original estimate. Such corrections based on definite information should be made in order to standardize the exact work that the tool will do, and in making these corrections the speed, feed, and cut should also be given due consideration.

Tool Set-Up Key Card

In most factories, there are a certain number of operations on automatic screw machines, hand screw machines, turret lathes, etc., that require a complement of several tools, and several different complements for different operations. In order to register all this, the "Tool Set-Up Key Card" (Form 28) is provided.

The data filled in on this card will be obtained from the tool key card (Form 27), and from the fixture and die key card (Form 29), so that when it is necessary to set up a job the tool set-up key card can be depended upon to requisition from the tool crib or tool storage everything that is required for processing the given operation.

Undoubtedly, the number of pieces per grind on different tools in a set-up will vary; therefore, the time periods

that will be allowed for changing tools must be based upon the tool that has to be ground most frequently.

On the tool set-up key card, under the caption "Operation" must be given a description of what the operation is; not its symbol.

Fixture and Die Key Card

This card (Form 29) is used in connection with the two foregoing cards, to record the necessary fixtures and dies that may be required for an operation, either in conjunction with the tool set-up, or on an independent piece for some particular operation.

From the foregoing descriptions, the relation of the three tool and fixture cards can be easily understood, as well as their use. It is to be borne in mind that these cards are not purposed to be used in connection with the manufacture of tools, or for inventory purposes, but solely in connection with the use of the tools.

Operation Studies

In organizing the work of a production department, the operations required in producing the various pieces, parts, and units must be filled in direct on the piece, part and unit key cards (Forms 20-22) by the drafting or engineering department. When this is done, the production department should make a careful study of operation performances in the factory. As a result of these studies, it is frequently found that many operations, or the machines and tools employed on them, can be rearranged or combined in such a way that the work can be done more economically and rapidly.

In analyzing an operation, there are two separate and distinct considerations, the one relating to the method of procedure, the other to the time required to do the work.

This necessitates a mechanical or operation study for establishing standards, and a time study for establishing costs.

Taking up the time study, there are two ways in which such a study may be conducted: one which treats the operation as a whole as illustrated on the "Operation Study Card" (Form 30), including the total net time required without considering the time needed for the rotations or motions made on the operation, and another method which takes up, in connection with the foregoing, the rotations of the operation and also the motions made by the operator, as shown on the "Motion Study Card" (Form 31). The practicability of either method depends altogether upon the nature of the work and the conditions under which it is done. Short runs and a constant change of work make the latter method impracticable, whereas long runs on individual pieces and operations make it not only desirable but necessary.

Operation Study Card

In order to determine the operating efficiency of a plant, it is necessary to make complete studies of all operations required on pieces and parts, and for this purpose operation study cards (Form 30) are provided. These cards, and also the motion study cards discussed later in the present chapter, are intended to be used on study boards made to hold several cards, so that the man making observations can carry them conveniently from machine to machine and make his notations on them. After the operation study has been taken on the card, the information obtained is transferred to the operation key card (Form 33), which is designed for constant use in the production department in making out time tickets and routing the work through the factory.

On the operation study card is given the piece number

and name, and when the card is finished and brought into the production department, it should be given a study number, these numbers being given in rotation as the cards are received. In case a study is taken to supersede a former study, the study number that it supersedes is shown; and when this card is superseded by another in its turn, the number of the new card will be shown on the superseded card so that any study card will show the number of any preceding or subsequent study.

One of the objects in making the study of an operation is to determine the size of the lot best handled in performing that operation, so that when the study of all the operations is completed, the size of the lot which can be put through and handled to best advantage for any operation can be known at once by reference to the study card. To illustrate, on a job started on an automatic machine, the pieces on the first operation may be turned out at the rate of 1,000 a day, this being a convenient-sized lot for the automatic machine; however, when the next operation in the machine department is reached, an average day's work on a hand screw machine may be only 200. Again, it may happen that for some of the following operations a still smaller lot would be found advantageous. To avoid delay and to enable the work to be pushed through with the proper rapidity, it would perhaps be better to put through lots from the *first* operation of, say, 100, instead of 1,000, as work upon such a large quantity would hold up and delay subsequent operations.

In order to handle production on schedule and with a knowledge of just what is being made, and to facilitate routing, costing, inspecting, etc., in the factory, these lots should be maintained in their identity from the first operation until they are turned into stores as finished. There may be some occasions when it will be necessary to split a lot,

but this should be done only in a very great emergency, and, when done, each split lot should be tagged as "Part of Lot No. ....., Production Order No. ....."

Making the Operation Study

A special department may be devoted exclusively to experimental time study and rate-setting, or this may be one of the functions of the production department. In either case, when the headings of the operation study card for the piece to be studied have been made out, the person having the study in hand should begin in the department of first operation and then observe each operation in the manufacture of this piece in sequence, using one card for each operation, and making such changes in the manner in which the work is done as he finds necessary or economical. He enters upon the card the operation number and the description of the operation. This description will be a general term, as "Mill," "Drill," "Turn," but in addition the rotations or steps of each operation must be given. Thus, operation "A" might be "Turn," but this turning, to be carried out to the best advantage, should be done on the lathe in a certain order or rotation, rotation 1 being "Rough Turn Outside"; rotation 2, "Finish Outside"; rotation 3, "Bore"; rotation 4, "Ream"; rotation 5, "Face Top"; rotation 6, "Finish Inside"; rotation 7, "Face Bottom"; etc. The rotation of each operation should be carefully studied and, when once decided, the workmen should follow these rotations implicitly in the order given; for if in the case above, boring and reaming were done first and the turning and finishing of the outside afterwards, it might throw the piece out of alignment and make the operation unsatisfactory.

In many instances rejections have been reduced 50 to 65% by a careful study of the rotations of operations. The

importance of a proper rotation of operations cannot be overestimated.

For each operation the machine number and department number should be inserted on the operation study card; also the feed, speed, and cut of the machine best suited, as well as the fixtures and tools required, thus furnishing by operations a complete history for each piece as it goes through the factory together with its routing from machine to machine and department to department, from the first operation to the last.

When the operation study on a piece is completed, the operation study card should be signed by the person taking the study and be turned in to the production department. Here the data contained on it is transferred to the operation key card (Form 33), and from this card entered on the piece key card (Form 20), thus completing the information on this latter card which is used chiefly by the planning clerk. The entry of this information does not, however, complete the data for the operation key card which is used by the planning clerk, as the time allowance, time study number, and wage rate are yet to be entered.

In a great many cases it will doubtless be found that different workmen have different methods of doing the same work, and while there is a general standard for the operation, yet there is a great deal of variance from this for no good reason. It is, therefore, a first essential to standardize these operations as they are gone over. The man delegated to this work may find that changes in tools, fixtures, or speed of machine, or feed, will be desirable in increasing the output of the piece, and he should be given full authority to make such changes as seem to him advisable, after going over the matter with the workmen, foreman, and other persons interested.

The result of this careful study of each piece made, fre-

quently develops material economies in operations, together with much greater general efficiency and a correspondingly increased output.

When operations have thus been standardized, a complete history is obtained of all work done in the factory, of all machines available for this work, and of all tools with which it may be done.

Motion Study Card

In order to take the detail of time required for operations, a "Motion Study Card" (Form 31) is provided, and one of these cards is used for each operation on any given piece which requires scientific analysis. A motion study card should be made out in full detail in the factory from simply observing the operation, but should get its first data in the production department from the operation study card (Form 30), so that the basis of the study and the motion data shown on it will be exactly the same as the instructions to the workmen for processing the piece, for which the operation study card is the authority.

The piece number and name, operation number and name, and operation study number are taken from the operation study card, together with the machine number and department number in which the study is made, and all this is inserted at the top of the motion study card, and the operator's number and name will be filled in after going to the department. The speed and feed, as well as the fixtures required, must be given for each operation. Then the study man will watch the operator set up the job, taking the time of same with his stop-watch, time him at least four times on each rotation, and also time him on taking down the job. The number of pieces made will then be inserted in the column following, and the average time for each piece in the next column.

The motion study as now completed is available for several purposes: first, for the ascertaining of labor requirements; second, for the scheduling of labor needed; and third, as a basis for piece or premium work.

The motion study card shown in Form 31 has been filled in with data taken from an actual time study. The details of this study as presented are practically self-explanatory, it being understood that all figures of time made are shown in tenths of an hour. These time studies cover all the rotations of one operation.

In order to illustrate further the method of procedure in taking time, the motions to these operations, showing the use of both the left and right hand, are given in Form 32. This illustrates what time and motion studies mean if gone into in detail. In actual practice this data should appear on the motion study card which should be printed on both sides; one side for operation rotation data, the other for motion study.

When the motion study is complete, and the results are entered on the motion study card, the card will be signed by the person taking the study and turned in to the production department. Here the time allowance will be set, with the high rate and low rate of earnings possible under it, any further remarks being entered in the last column, if necessary.

In setting the time allowance, consideration should be given to the fact that a motion study is usually taken under conditions of high tension; that the employee is supposed to be working at more than ordinary speed; and that in most cases it would not be possible for a man to average this speed all day. Therefore, a time allowance should be made for a longer period than that actually observed. This, of course, will have to depend somewhat upon the nature of the work, the manner in which it is handled with regard to

tools, etc. In case the operator should be required to set up the tools on his machine, or to leave the machine to get tools or materials, the time consumed in this should not be included in the time allowance.

Before leaving the subject of motion study, a word of caution should be inserted here. Detailed procedure such as that described is not adapted to every kind of business, or to every article made. Good judgment is required to know to what extent the methods suggested should be adopted in actual practice. The fine detail illustrated here should be applied only on work which is done on a large scale of duplication; for instance, if a man and machine are put on one piece of work for days and weeks at a time, this nicety of detail would be of great value; but if it is work that changes from day to day, or has short runs, this detail is nearly always expensive rather than economical.

Another caution in connection with work of this character relates to the character of the labor employed. Unless there is reasonable stability among the operators, there is not much profit in educating them to the motion studies illustrated. If, for instance, in a factory operating 2,000 men, 4,000 or 5,000 men are hired annually, the educational work required to carry out the detail of time and operation studies would cost far more than the savings made.

Operation Key Card

This card (Form 33) will show the history of each operation as required by its captions, its data being as taken from actual observation, or as changed to correspond with the operation and motion study cards. The operation key card is for the use of the planning clerk in planning work for the factory and in making out tracing tags and workmen's production orders. He should have on his desk a complete file of these operation key cards in the order of

their piece number, and of the various operations required for each piece. It is evident, from the purpose for which these cards are used, that any changes made in the operations must also be noted on this card, so that it will correspond with the operation study card by which the changes were authorized.

Owing to defective material or for some other reason, it will, from time to time, be necessary to make an extra operation on some pieces; and in such a case, during the time this extra operation is required, a pencil notation of the extra operation should be made on the operation key card between the others, as operation "A–½," "B–½," etc.

In explanation of the operation key card, it will be noted that the data as to the tools and fixtures required are taken from the tool key card and fixture key card, and that data as to the speed, feed, cuts, and lubricants are taken from the operation study card. The operation key card is thus made to contain complete information for making out time tickets and instructions to workmen not only for doing the processing work, but for the rotation work as well. Further, this card has full instructions thereon as to time allowed and the wage rate paid.

Rate Memo

After all time study work is done, a rate memo (Form 34) should be made out by the experimental or time study department in accordance with its findings, for each and every operation. On this slip or card appears definite information as regards the conditions under which the operation was tested out, and adjustments must be made on factory equipment to meet the requirements as to speeds, feeds, cuts, etc., of the rate memo.

The rate memo, as it comes from operation and time study work, only shows at what rate work may be done

per hour or per period of eight hours. The price for doing the work must come from the superintendent or from a wage board, and be based on the fact that piece-workers or premium workers should earn anywhere from 20% to 30% more than they would have earned on a day-work basis. If milling machine hands, for instance, are demanding $3 a day, they should be allowed to earn about $4 per day on piece-work or premium work. Therefore, the number of pieces that can be done in eight hours, divided into $4, is the approximate rate which should be set.

This form is made out in quadruplicate; one copy of which is sent to the accounting department to check time and also to make the required postings from the rate memo to the rate cards. The second copy is sent to the department doing the work, as a notification to the foreman of the rate. The third copy is for the files of the superintendent controlling the department in which the work is done. The fourth copy (white cardboard) is kept in the reference files of the experimental or time study department.

CHAPTER IX

SCHEDULES

Manufacturing schedules, covering labor, material, and finances, and a consideration of the relation of these schedules to each other.

CHAPTER IX

SCHEDULES

Purpose and Scope of Schedules

In order to standardize production in any plant and handle it so as to give constant and full information as to manufacturing conditions and results, and at the same time yield a maximum output for the investment made, it is necessary to put all work through the factory on a schedule basis, planning it ahead and purchasing all materials accordingly. It is thus, and thus only, that assembling departments can be assured regular and sufficient quantities of material to maintain a constant delivery of finished product.

Of course, scheduling the production for a factory presupposes definite knowledge concerning the equipment of the various departments, together with standard data as to the various pieces, parts, and units to be made, as set forth in Chapters VII, VIII. It must, however, be understood that scheduling means much more than the mere systematic adjustment of all this to the items required for such manufacture. It means the scheduling of material to be purchased, together with the delivery dates of same; a scheduling of the labor required, and, finally, a scheduling of the moneys required to finance these purchases of labor and material. In other words, the superintendent or works manager of the plant will make up, from the data supplied, a schedule of labor requirements showing the number of men needed based on the number of man-hours required to do the work, without regard to cost. The purchasing

agent will make up a schedule of material requirements by kind, quantity, and deliveries, irrespective of money values; while the treasurer will make up a schedule of financial requirements for labor, material, and general expenses.

Manufacturing Order—Master Schedule

The first consideration in arranging the systematic operation of a plant is the output of each model and unit required for each manufacturing year, together with the weekly or monthly requirements as to deliveries. Such a specification constitutes a manufacturing order and this order must necessarily be O K'd by the proper executive, usually the general manager, before it becomes effective, after which it is to be passed to the production engineer and superintendents for scheduling and manufacturing the pieces, parts, and assemblies required.

This primary manufacturing order will in reality be a schedule of sales requirements; that is, it will indicate the deliveries of the factory as required by the sales department, divided into weeks, months, etc., for some definite time period (usually a year). This information can be tabulated on a schedule sheet similar to that illustrated by Form 35, which therefore becomes a "Master Schedule."

These master schedule manufacturing orders should be numbered in rotation, and one made for each different model and unit required. When the production engineer receives such a manufacturing order, he should issue production schedules to show exactly what the factory must produce each week and month of the year in order that this output may be maintained.

In case of changes in the manufacturing or sales policy of the company during the year, other manufacturing orders must necessarily be issued to cover these changes. It should be borne in mind, however, that not only deliveries but

also purchases must be made in accordance with the original schedule, so that any change made in the manufacturing schedule will affect the kind and quantity of material purchased.

Production Schedule

The master schedule calls for the total output of each model or unit; the production schedule (Form 36) provides for the parts and pieces of the models or units called for by the master schedule. As soon as a master schedule for a completed unit or model has been issued, a separate production schedule should be made out for each part and piece required by the master schedule. The manufacturing order number appearing at the top should be that of the master schedule, and the total requirements for each and every piece and part should be shown on the production schedules.

On the production schedule, the spaces marked "On Hand" and "Balance to Schedule" should be filled out only when a very excessive amount of parts and pieces is on hand, as this information is really meant for use at an inventory adjustment period. Under ordinary conditions, the stock on hand should be relied upon for repairs, etc., and does not enter into the making up of a schedule.

The rate per day or week at which each piece must be manufactured should be shown on the production schedule, together with the date that the schedule begins and ends, and the number of days it has to run.

In making up the schedule sheet for each piece, "Total Requirements" will be ascertained by reference to the piece, part, and unit key cards (Forms 20-22). The piece key cards should be gone over consecutively, as they will show all the units and parts for which the piece is required, and the total number of pieces needed for the units specified in the master schedule can be readily determined and shown

on the production schedule. For instance, if in September, 50 of model "Roadster" are required, 40 of model "Road Racer," 60 of model "Juvenile," and 30 of model "Jobbing" (making a total of 180 models), on all of which three of a certain piece are required, the schedule of this piece for that month would be three times 180, or 540. This operation is repeated for each of the succeeding months, to cover the requirements of all the units or models using this piece.

This again illustrates very clearly the desirability of the "Parts Common to All" plan of manufacturing, in which everything is done on a pieces and parts basis, all the scheduling, planning, and costing work being shaped to this end, rather than by the "Complete Unit" plan, and it need hardly be said that a system of manufacturing upon a basis of merely keeping machine equipment busy regardless of delivery requirements is wholly undesirable.

To this end, the schedule of each piece should indicate the total number required for all units and models before the manufacturing orders and production schedules can be converted into production orders (Form 40). When this plan is followed, each piece will be manufactured as a standard piece to be used on different units, and consequently each piece can be used without regard to which particular unit has the greatest sale, provided the number of units in the aggregate is up to expectations. Therefore, it is perfectly safe to manufacture such a piece in a dull season and so give the factory a constant load factor; at the same time there is an opportunity to manufacture in quantities sufficiently large to obtain a low cost of production.

One of the important considerations from a cost point of view is the *number* of pieces and parts called for at one time or in a given production order. With sales rapidly increasing or decreasing, it may be a difficult matter to

handle the manufacture of certain pieces or parts in the quantities called for and at the same time obtain the lowest cost of production. In such cases it may be that such quantities can be bought cheaper outside in a finished condition.

For instance, in the manufacture of a certain piece the total requirements for a season might be 2,000. Manufactured in this quantity the cost of production may be greater than this piece could be bought for outside. On the other hand, if 6,000 of these pieces were manufactured at a time, the cost of production might be considerably less than they could be purchased for outside. But 6,000 would be a three years' supply and the interest on such an investment would probably be greater than the saving effected. There is also the danger of obsolescence. The necessity is therefore apparent of closely watching all of these factors, particularly when pieces or parts are run in small batches from time to time, or in a small quantity made up for a whole season's requirements.

While, of course, the manufacturing order shows the actual sales delivery requirements from month to month, it is not often that the pieces or parts required are manufactured at exactly this monthly rate, as this would mean anything but a constant load in the factory. On the contrary, a production schedule controlled by manufacturing orders should be laid out for such quantities as can be made most economically, and in some cases a year's supply might be made up at one time, but in so doing machine equipment is released during a subsequent period for the manufacture of other pieces, which, if this practice was not resorted to, might be far behind schedule, thereby holding up the complete assembly of units and models.

The production schedule having been completely planned, is then ready for processing operations in the factory, but

before taking this up, the scheduling of labor, material, and financial requirements must be considered.

Purchase Order Schedule

The scheduling of material requirements is just as important as is the schedule of manufacturing requirements, for upon obtaining the right quantities of material at the right time all factory operations depend.

The purchasing agent having been furnished with a duplicate of the production schedules by months, will obtain from his set of the piece, part, and unit key cards (Forms 20-22) the exact kinds and quantities of material required. He will then make out a schedule sheet (Form 37) for each kind of material, either by months or any other time periods in accordance with the general purchasing policy. This sheet also shows the requirements as to delivery dates and payments.

When making out these schedules, the purchasing agent should go over his piece and part key cards in much the same manner as the production engineer does, and make a list from these key cards of the quantity of material required each month for the number of pieces and parts shown in the manufacturing schedule. When all pieces and parts requiring any particular kind and size of material have been gone over, the total quantity is entered on the purchase order schedule (Form 37) as the total requirements for that kind of material. This is then divided into time periods, under the column headed "Schedule." The requirements for succeeding months or periods are figured out in the same way.

As soon as purchase order schedules are made out, the purchasing agent should issue his purchase orders for deliveries of material according to his schedules. (See Form 4.) The order number, date, and quantity ordered must

be entered in the "Purchase Orders Issued" column of the purchase order schedule.

The purchase orders should require delivery of material at the factory at least six weeks before the date required by the production schedules. This is necessary because the production schedule is for completed pieces and parts. The manufacture of pieces and parts, in most cases, should begin thirty days earlier, and beyond this some allowance must be made for delays in delivery. An addition of at least 10% should be made to the material requirements of the production schedules as an allowance for spoilage and repair parts.

As soon as the purchasing agent receives a "Material Receipt and Notice" (Form 6) from the receiving clerk, he will turn to the purchase order schedule showing this material and enter the quantity thus received under the column "Received," carrying his cumulative totals forward from time to time and showing the number of days ahead or behind schedule. This enables the purchasing agent to keep a full check on all materials coming in and on material which is overdue, thus helping to bring about prompt delivery of all materials and preventing delay in the work of the factory.

When the purchasing agent issues purchase orders direct from the purchase order schedule without a purchase requisition, the stores clerk will enter the quantity ordered on his stores record (Form 9), taking this from his copy of the purchase order at the time the order is posted, just as if a purchase requisition had been issued. His record will thus show (when stores "Reserves" against production orders issued are entered) the amount of material that can be depended upon as available for further production orders for any given period.

Scheduling Labor

The question of scheduling labor requirements may be considered at this point. The superintendent, or works manager, having been furnished with a copy of the manufacturing schedule of each piece and part, will be able to estimate his labor requirements, by figuring out the man-hours required to do the work.

From the analysis of plant capacity (Chapter VII) it will be possible to lay out a general policy for employing help and make provisions for securing it whenever it is required.

If, according to the analysis of plant capacity, it is found that the manufacturing schedule calls for more output than the machine or possible man capacity warrants, the superintendent should at once take the matter up with the purchasing agent so that he may arrange to purchase outside such parts as cannot be made advantageously in the factory under existing conditions.

Most manufacturing concerns have been in business for a considerable period of time and have in their possession data concerning costs and the time required for the operations on each piece and part. With a definite schedule of daily, weekly, and monthly requirements, it is by no means a difficult task to figure out from the productive labor costs just what labor is required to process any given schedule; and as operations are always confined definitely to departments, the cost per department is also easily obtained. For instance, if 50 men are employed in a certain department to meet schedule requirements and the pay-roll shows that the average wage is 35 cents per hour, the hourly, daily, weekly, and monthly costs of productive labor for the entire department can be quickly figured, as well as the man-hours required to do the work. From this data the number of men required for a given amount of

work to be done in a definite period of time can easily be determined.

The amount of all non-productive labor employed in the factory is shown on the "Overhead Distribution Sheet" (Form 77). From this can be obtained the non-productive labor costs of each department, and the number of men required for non-productive work, by departments, and also for the factory in general.

To aid in checking labor performance, a schedule of labor requirements may be made out, or these data may be plotted on a cross-section chart and then checked against the actual performance from week to week and month to month.

Since processing requires the combination of machines and labor, the amount of labor to be employed depends upon the machine capacity available.

The time that it will take to get out any schedule depends, of course, upon the number of men utilized. If it is desired to manufacture units or models requiring $50,000 worth of productive labor, and if the average wage is $3 per day and 100 men are employed in processing, the number of days required to produce the schedule is found by dividing 50,000 by 300, or 166⅔. In other words, whenever productive costs are known on any item of manufacture, time periods for the schedule depend upon the number of men that can be employed on the work. Hence, it is imperative to know exactly what the plant capacity is, as discussed in Chapters VII and VIII.

Scheduling Financial Requirements

It is the function of the treasurer to provide for the financial requirements of both labor and material. Having been furnished with copies of the master schedules and also having the production schedules for pieces and parts, he

will be able to estimate the amount of money required to pay both for labor and material for the entire year, as shown in the following illustration:

Supposing that a schedule calls for 10,000 of a certain piece; that according to the time study cards and operation key cards, the total number of man hours allowed for each of these pieces is five, and that the average wage as shown by the time study and operation cards is 24 cents an hour; the approximate labor cost of each piece would then be $1.20, or $12,000 for the total quantity of 10,000 pieces.

By going over each piece and part as specified on the production schedule, the total money required for the productive labor for the year can be easily computed; and non-productive labor by departments, as shown on the overhead distribution sheet (Form 77), can then be anticipated and added to these productive labor requirements.

These data should be transferred to a graphic chart that will show separately the weekly and monthly pay-roll requirements (both productive and non-productive), and then the actual pay-roll should be checked against it from pay period to pay period.

As soon as costs of all pieces and all departments have been ascertained, the amount of labor required for any schedule can be immediately determined and an absolute check kept on the factory in regard to the use of labor.

A further check on factory labor as between productive and non-productive, and as between the various kinds of work done, is described in Chapter XII, "Distributions." So complete is this check, that no matter what the variation is from predetermined labor requirements, it is possible immediately to discover the department, the foreman, and the individual operator responsible for the variation, and the particular order or piece, the cost of which is affected by this variation.

When the material deliveries have been scheduled by the purchasing agent (Form 37), their quantity, plus the price, will enable the treasurer to lay out his schedule for financing the purchase of this material according to the time periods shown.

Importance of Schedules

The importance of these schedules relative to labor, material, and financial requirements cannot be overestimated. Together with the other data of income and expenditure as shown in the monthly balance sheets, they will give the treasurer definite information as to financial requirements for long periods in advance and often enable him to secure decided advantages in placing contracts. Then, with these materials delivered according to schedule, the factory, as already stated, is in a position to manufacture on the most economical basis as regards both labor and material, and the production department can be utilized to its greatest efficiency.

To sum up, the schedule method puts into a manager's hands a means for predetermining achievements—the results which can be derived by certain combinations of labor, material, equipment, and output. Then, as means have been provided for checking up these results from day to day, adjustments can be made as they are needed, either by changing the schedule rates for men to be employed, or the quantity of material required, or by an increased effort in the sales department, so as to maintain an even factory output with a corresponding uniformity in cost and consequent profit to the company.

Graphic Charts

Charts are frequently used in connection with schedules, and two of these are shown in Forms 38 and 39. Both of

these charts are of an entirely new type, inasmuch as they are a combination of calendar time and numerical quantities. In a chart such as Form 38, to the left of the sheet, space is provided for a vertical column of figures and, at the top, space is provided for a horizontal row of figures, while the main body of the chart is divided up vertically in calendar time by months, weeks, and days, and horizontally by working time of six days to the week. Each small square represents a day either vertically or horizontally, and it also represents a number corresponding to whatever figure is written in the left-hand column under units, in the same sense that it corresponds to the number at the head of the columns from 600 to 31,200 inclusive.

The component schedule illustrated in Form 38 is plotted from a production schedule. The number required cumulatively from week to week is shown by the numbers at the top of the sheet. The figures shown there represent the number of components or pieces that are to be processed and completed within the time periods indicated in the month, week, and day columns. On the left-hand side of the chart are shown the names and numbers of the operations that are to be performed on the component or pieces in question.

The straight oblique lines indicate the schedule time periods for the complete processing of each component. In other words, between the first operation and the last operation there is a uniform time lag (including Sundays) of sixty days; that is, it takes sixty calendar days to produce this particular component. The finishing operations shown on the chart in January cover work begun at an earlier date and the first operations on this component would be shown on the preceding chart commencing November 1.

The heavy black lines are plotted against the oblique lines, and show to what extent the component in its progress is ahead or behind schedule requirements. Beneath these

plotted lines is a line called "Component Stores," which means the same thing as "pieces and parts stores" or "semi-finished stores," whereby is shown the number of days the component stores are ahead of manufacture. Beneath the component stores line is a base line which simply means that, if this line is reached, assembling will have to be stopped as there will be nothing in component stores from which to draw. This, as shown by this chart, was actually the case in the week ending February 5.

The purpose of this chart is to check up from week to week or month to month, as the case may demand, the various operations on each component, and to find out to what extent the factory is maintaining a uniform balance or flow of product. To illustrate this, the week beginning July 1 showed that there was a drop-off on operation No. 9. It is at a point like this that attention should be centered in order to move the operation up to balance. It should be noted that all operations done in the drop-forging shops are prefixed by the figure 10, thus running from 101 to 105 inclusive, as at this point the component goes into temporary storage, and is from here given to the machine shops under a new production order and lot number.

The chart illustrated in Form 39 shows the actual unit requirement per week as plotted from a master schedule; the numbers in the spaces at the top of the sheet indicating the quantities. Line A is the weekly schedule. Line B shows at a glance how many days manufacturing is ahead of this schedule. To illustrate, in week ending January 15, the schedule was exactly two weeks, or 12 days, ahead of manufacture, while for week ending May 6, the schedule was 2 days behind. Line C shows, as per vertical numerical column, the number of complete units assembled each week, while Line D shows the total units that were good. In other words, the difference between C and D is

the amount that was thrown out for various reasons. Line E shows the percentage of good units obtained, as per the percentage column at the right-hand side of the sheet.

The data represented by lines F and G are of interest and importance. Line F, in accordance with the column numbered on the left of the sheet, shows the number of men employed daily, while G shows the number of units output obtained per man. A comparison of these lines may bring out many interesting points. For instance, in the week ending February 26 the number of men employed was 2,900 (line F), and of the 6,000 units produced, as shown by line C, only 3,600 units were good (D). On the other hand, in the week ending November 25, 2,500 men were employed with a total production of 6,500 units, out of which 5,800 units were good.

Turning to line G, it is seen that the output per man was lowest during the period April 8 to 22, and highest during the week ending August 12 and also from November 18 to 25. This chart then shows at a glance the efficiency of the labor force employed during a long period of time and will no doubt prove of value to the factory superintendent or manager of works.

Similar charts can be plotted so as to show the schedule for labor, material, and financial requirements, and the actual performance can be checked against these.

CHAPTER X

CONVERTING LABOR, MATERIAL, AND EXPENSE INTO FINISHED PRODUCT

A method for issuing production and other orders to a factory as a whole, and to individual workmen, together with various forms of collecting the time of employees; also an illustrated description of planning methods and of planning or control boards.

CHAPTER X

CONVERTING LABOR, MATERIAL, AND EXPENSE INTO FINISHED PRODUCT

Classification of Orders

In the handling of production orders, it is usually necessary to confine the work to one method of procedure. This method is prescribed by a central planning station which directly controls all the work throughout the factory, or controls it through several sub-planning stations. In either case the method of procedure would be uniform throughout the factory, because the sub-planning stations are under the general control of the central planning station. Also the data employed on the forms to be used are identical. Which method of handling production orders is the better, is a question of organization and beyond the scope of the present work. The consideration here is the actual putting of work through the factory, and provision for all the detail necessary thereto.

It is taken for granted that a stores system has been established in such a way as to give a perpetual inventory of all materials and supplies that the company may buy, and that this inventory is held in a controlling account. Under these conditions, in order to authorize the delivery of material to the factory, it is absolutely necessary for costing and accounting purposes to have an order of some kind to which all material, labor, and expense can be charged, and these orders must be known and controlled by consecutive numbers.

To cover *all* labor, material, and expense used in the operations of a factory, four different conditions must be provided for, these requiring four different kinds of orders. (See also Chapter IV.)

1. Production Orders. These orders relate exclusively to goods made for sale, where the exact amount of labor and material required for production can be charged. Such orders are issued to cover whatever quantity, kind, or size of unit, piece, or part it is desired to make at any particular time; and all material drawn from stores, and the labor used for processing it, must be charged to these production orders as production costs. In addition to this, a prorated amount of overhead must be charged as described in Chapter XII, "Distributions."

2. Betterment Orders. These orders relate wholly to such plant improvements as increase the capital investment of the company. Whenever any work is to be done which will effect a plant betterment, a betterment order must be issued therefor by the proper authority, and to such order must be charged all of the material drawn from stores for use thereon, all of the direct labor employed in its execution, and a prorated amount of overhead, the same rate as applied to regular production orders.

3. Repair Orders. These are orders issued for the replacement, repair, etc., of buildings and equipment, and are designed to take care of all repair work done for, or by, various departments. To each individual repair order should be charged all of the material drawn from stores and all of the labor employed; but repair orders do not bear any portion of the general overhead charge, as repairs in themselves constitute a portion of such charges, which in turn are distributed to production and betterment orders.

4. Prorating Orders. These orders are designed to cover productive work that is done in bulk and prorated

over the product made, such as painting, enameling, plating work, etc.

Production Orders

Production orders authorize work to be started in a factory. A production schedule (Form 36) for all the pieces and parts required having been prepared, the next step is to prepare and issue production orders (Form 40). This form is provided in quadruplicate, each copy of a distinguishing color, as green for the original, blue for the second copy, pink for the third, and buff or yellow for the fourth. The back of this yellow card contains data taken from the tracing tag (Form 43).

With a production schedule in front of him, a schedule clerk can make out a production order for each of the pieces and parts required to be made, the quantity specified on a production order being ordinarily about a twenty-five or thirty days' run. This is because it is desirable to have production orders cover such quantities as can be costed out within a month, if possible; that is, a complete production order should be finished and turned into stores within a month from the time of issuance. Of course, if a steady run is being made on these parts, it would simply mean operating from one production order on to another, and each of these orders would be finished and costed out about every thirty days, so as to leave the amount shown in "Work in Progress" or "Unfinished Production Orders" at the end of the month, as small as possible.

Production orders should be numbered consecutively, and, if they are issued in supplement to some previous production order, the number of this previous order should be shown after the "Supplement Number"; also the date of issuance and the account which is to be charged (whether component or finished stores) should be given, and, if the

production order is issued for the filling of some particular sales order, this sales order number should be shown. Then the quantity called for, the piece or part number, the specifications, and special features or instructions will be entered.

The original copy of each production order should be kept in the production department and filed consecutively by order number. When the order is completed, if desired, the cost for labor, material, overhead, total cost, and unit cost can be entered, and the order filed in the superintendent's or production engineer's office. When issued, the third or pink copy should be sent at once to the stores clerk in charge of the particular stores room from which the material for this order will be drawn. This will be his authority for issuing the material called for by the order, and he should file the same by the order number.

As soon as a production order is completed, the stores clerk should forward this copy, together with his sheet showing material distribution on this order (Form 16), to the distribution department for a proper distribution of costs. The second or blue copy should be filed by order number in the distribution department, and when work on the order is completed, it should be turned over to the production department with the total labor by operations shown. The fourth or yellow copy is kept in the production department and filed by piece and part number and thus becomes a working copy for the use of this department.

Tracing Tag

A tracing tag form has been provided (Form 43) which is to be attached to each lot of material at the time it is issued from stores and before the first operation. After once being attached to any particular lot of material, the tag must remain with it until the work on the lot it covers

is completed and is delivered either to component or to finished stores.

The purpose and method of handling the tracing tag are as follows: When the production department is ready to issue a production order, it prepares from piece key cards (Form 20) one tracing tag for each lot of each piece covered by the production order, and, as provided for on this tag, there should be shown the piece number, quantity to be started, production order number, lot number, date to be started, and date to be finished, together with such other information relative to the departments in which the various operations are to be performed on the work as may be required.

As soon as these tags are made out they should be posted to the reverse side of the fourth or yellow copy of the production order, where provision has been made under "Started" to show the lot number, date, quantity, etc., together with the cumulative quantity as the work progresses. After these tags have been duly posted, they are ready to be turned over to the planning and routing clerks for the issuing of production tickets (Form 44-46) as called for by the operations on these tags. As soon as the routing clerk receives tags of this character, he will post on to them from his piece key cards, the operations required by number and name, and also enter on the tag in proper order of arrangement, department number, machine number, etc., for each and every operation, going to the reverse side of the tag with the operations if necessary.

As stated before, the tracing tag is to be retained with the particular lot to which it is attached through all operations through which that lot goes, and it must show the O K check of an inspector for each operation, also the inspector's notation, as "Recovered from Repairs," "Rejected for Repairs," "Rejected for Scrap," together with

the date the inspection was made as indicated by the inspector's initial or punch.

When each lot is completed and received in component or finished stores, the pieces are counted by the storeskeeper and this count entered on the tag, together with the bin number in which they are placed. The tag is then dated, signed, and turned over to the stores record clerk for entry on the stores records, after which it is forwarded to the production department where the routing clerk will enter on the back of the production order the quantity finished in this particular lot. Thus, on each production order there will be a complete record of the work started and completed, this record also serving to give the routing clerk full information as to the balance of lots to be done, numbers of these lots, etc. Great care should be exercised in making out these production cards accurately, as they are the key to the proper handling of all work in the factory. Whenever work is completed, the tracing tags should be filed consecutively by production order number and lot number, for future reference as to how work has been handled regarding rejections for repairs, scrap, etc.

Issuing Material Requisitions

After the tracing tags are made out, general stores requisitions for the material on the piece key cards must also be made out (Form 10). The requisitions should be numbered, this number being a combination of the production order number, the letter of the operation for which the material is used, and the highest lot number for which this requisition will furnish material. Thus, if a requisition is made out for material required for the first operation on production order No. 1000 for five lots, the requisition number would read "1000–A–5." When later five more lots are started, the requisition for these second five lots

would read "1000–A–10," as being enough material for the completion of the tenth lot of this production order. These requisitions may then be turned over to the planning clerks with the tags.

Production Tickets and Daily Time Slips

As a standard practice, labor is paid by any one of three methods, viz., day-work, piece-work, or premium work. No matter which of these methods is used, the issuing of instructions for doing the work, would remain unchanged, as well as the counting of the quantity done, and the record of the time consumed. However, the method employed for calculating the amount to be paid would be different in each case.

The different methods of paying labor have been so well covered by excellent literature and lectures as to make unnecessary any description here. There is, however, a production ticket (Forms 44-46) for each one of these methods, each ticket being properly spaced and captioned on the time-keeping side, so as to make possible correct and rapid computations. These time tickets are in themselves explanatory. On the instruction side, the data called for are identical for each one; therefore, in this respect a description of one is a description of all.

These cards represent to a certain extent ideal arrangement and captioning. However, the same information could be presented in different shape and it is often necessary to do so when designing time tickets to be used on or by certain accounting machines and time or cost clocks. It is recommended that, wherever possible, time be kept by the unit system of tenths for which most efficient appliances have been made by the manufacturers of time-keeping and accounting machines.

As soon as the routing clerks have received a tracing

tag and have entered the department numbers and machine numbers on this tag for each of the operations to be done, they should make out, from operation key cards, instructions for the manufacture of the pieces and parts called for on the tracing tag, these instructions being given on the day-work production ticket (Form 44), or the piece-work production ticket (Form 45), or the premium work production ticket (Form 46).

The production ticket number, as will be noted on the ticket, should be a combination of the production order number, the operation letter, and the lot number, thus saving the necessity of writing these numbers on another part of the ticket. This greatly simplifies the work of keeping costs of labor. To illustrate this system of numbering, ticket No. 1500–A–1 would signify that this ticket was made out to cover work on production order 1500, operation A, and lot 1. These tickets can be made out for all of the operations of one lot at a time, and would be numbered 1500–A–1, 1500–B–1, 1500–C–1, 1500–D–1, etc.

After tickets have been made out for each of the operations of any particular lot, the same process can be gone through in making out tickets for each operation of lot No. 2, and so on for each of the lots called for by tags. The date of issue should be shown on the ticket, as well as the date the operation is to be completed according to schedule requirements. The department number and the machine character number for doing the work will also be entered, but the man's number should be left blank to be filled in by the operating department where the work is to be done. The quantity wanted, piece number, and piece name can be given and the routing shown, that is, "Moved from Department No. .....," and "Moved to Department No. .....," etc. Below this will then be given instructions for the work required, all of which is to be

copied from the operation key card (Form 33), or from the assembly operation key card, for all assemblies of pieces and parts. The speed and feed of the operation should also be shown, together with the jigs, dies, or special tools required.

The rotation of the operation given on the production ticket should be followed exactly by the workman, as the card constitutes his instructions for doing the work, and these instructions should be made out exactly as shown on the operation key card.

Each production ticket must be made in duplicate; a thin, white original, with a cardboard duplicate underneath on which is made a carbon copy. The cardboard copy is used as the workman's instruction card. The original white copy is posted on the control board (Form 60). When work is given to a workman, he will be given the duplicate cardboard production ticket showing his instructions, which will be held by him until the operation it covers is completed. When the workman has completed an operation, however, this instruction card will be returned to the planning board and the workman will receive a new one for some other work. When the instruction card is turned in, no matter whether it be on the date of issue or some subsequent date, it must be timed out for checking purposes and must be immediately forwarded to the accounting department.

Meanwhile, the white slip remains posted on the control board (Form 60), i.e., is pasted on the envelope in the pigeonhole, and if the work called for on any particular ticket runs for more than one day, the cardboard copy will remain in the workman's box or pigeonhole, but a daily time slip (Forms 47-49) for that workman must be made out and turned into the accounting department each day. By working thus, it is possible to keep absolute control of

all inventories, so that on the last of the month the tickets of each and every workman will have been turned in and will be closed out into "Production Orders, Finished and Unfinished."

When all of the operations on a piece have been completed, as called for by the tracing tag, this will be O K'd first by the stores-keeper, who will have received the material into the stores, and then by the routing clerk, who will close it and, together with all the tickets and slips, send it to the planning department where it will be filed for future reference.

This method of procedure means that the workmen will not be responsible in any way for keeping time, as he simply has an instruction card which he holds until he has completed the work, when he receives another instruction card. Meantime, the planning station will do all the timing on both the instruction cards and daily time slips and turn them in to the accounting department.

After an operation is completed, the production ticket and tracing tag will be turned over to the inspector, together with the pieces which have been made, and as soon as these have been inspected the inspector enters on this production ticket at the bottom the date finished and the number rejected for repairs, rejected for scrap, and the number good, either signing this ticket or punching it with his individual punch. At the same time, he makes the same notations on the tracing tag, showing the number "Rejected for Repairs" at this operation and also those "Rejected for Scrap"; he then enters on the line showing the next operation, the quantity "Good" which are to be forwarded for the next operation. He will then enter the date on the line above with his inspector's punch or initials and pass it on to the workman of the next operation.

The production ticket is now ready for the production

department and should be placed in the outgoing mail boxes for the messenger's next trip.

The daily production time slips (Forms 47-49) should be sent to the time-keeping department once a day; each morning all slips should be placed in the out-going mail box so that a messenger can take them to the time-keeping department, where the total time for the day as shown by the workmen's time slips, or non-productive, etc., time tickets (Forms 50-55) will be checked against his total clock time.

When a workman has completed a job and returned his production ticket to be stamped "Finished," the planning clerk should, at the same time, withdraw another production ticket from his "Jobs Ahead" file for this workman to operate on, and stamp it "Started" at the time the other is stamped "Stopped," so that there will be no delay in waiting for jobs.

The planning clerk in each department should have a list of the piece and part numbers and the operations that can be done on each of the machines in his department. This table should be always in front of him so that he can tell at a glance, when a workman comes for a production ticket, just what pieces and parts can be done on any workman's machine, and, consequently, know what production tickets to take out of his "Jobs Ahead" file.

Daily Defective Repairs Time Ticket

Defects in articles manufactured are continually occurring, due either to poor workmanship or to poor materials. In some instances these defects will make necessary the scrapping of the items; in other instances they can be recovered by applying certain repairs. These repairs, however, must be handled entirely separate from the regular productive work; otherwise any increase in the cost of

manufacture due to such defective material or workmanship cannot be readily traced.

In order to handle this work, a special daily defective repairs time ticket (Form 50) has been designed. Each foreman should be provided with a pad of these tickets and should use them for this work, and for nothing else, as indicated by the captions thereon. The department and the man's number should be entered, time started and stopped stamped as on regular tickets with the time clock, provision being made for two starts and stops on the same job. The amount column is left blank to be filled in by the timekeeper later.

Great pains must be taken by the foreman to get the number of pieces repaired registered on this ticket, together with the piece number and the production order number from which the pieces originally came. Wherever possible, the costs for such repairs should be charged to the original production order under which the pieces were first started. Like all other time tickets, these must be turned in daily to the timekeeping department after being properly O K'd by the foreman.

Daily Waiting Time Ticket

This ticket (Form 51) is of much more importance than perhaps appears at first thought. It is, of course, necessary to have time spent in the factory checked against the "In" and "Out" clocks. It is also necessary to provide registration for the time lost by workmen waiting for jobs, materials, tools, or for any other reasons. The daily waiting time ticket is to be used whenever a workman has to stop work and wait for any reason, as the time sheet (Form 73) is arranged to separate for each pay period all of this waiting time, by men and by departments. This makes possible a splendid analysis of lost time of this character

which can be charged directly to bad foremanship or a laxity of some kind on the part of the planning department. These tickets, after being O K'd by the foreman, must be turned in daily to the time-keeping department.

Prorating Orders

Thus far, consideration has been given principally to the manufacture of articles on a strictly production order basis. There are often instances, however, where it is not practicable to handle certain classes of work on a basis of production orders, owing first to the irregularity with which the work is put through a factory, and, second, to the nature of the materials used which can only be costed out on some prorating basis.

It becomes necessary, therefore, to make provision for the establishment of certain prorating orders to which certain definite kinds of work are to be charged, with the understanding that these prorating orders are always for productive work only. For these, no special form need be provided, as they simply require typewritten instructions from the proper authority for their installation. As all have different numbers, they become known through use from month to month and from year to year by their constant number. Therefore, all that is necessary for collecting the charges to them is to send a copy of these numbers to the production engineer, time-keeping department, and any other department which might be affected by them.

The manufacture of almost any product involves more or less work of this character. For instance, in the bicycle business, enameling is one element of this kind, also nickel-plating. Enameling should constitute one prorating order under a given number, and nickel-plating should constitute another prorating order under another number; the total

expense for each one of these should be prorated over the entire output made each month. Painting in many lines of work should be handled in the same way.

Sometimes it is necessary to create prorating orders in connection with automatic machine departments, as in such work one man frequently attends several machines, and to divide up the time of each man according to the particular machine on which he may be working, is rather a difficult and unsatisfactory process. Therefore, it often proves advantageous to take all this work and charge it to a prorating order, while at the end of the month the expense to the total number of pieces made is prorated according to the capacity of the various machines used in making these pieces.

This question of shop practice is touched upon at this point simply to illustrate the truth of the old saying, that every rule has an exception; prorating orders are the exception to standard production orders.

Daily Prorating Order Time Ticket

For the recording of time spent on prorating orders, a daily prorating order time ticket has been designed (Form 54), which can be issued through the regular channels of planning work or provided by the foreman of each department according to the nature of the business and the necessities of each case. This ticket is handled like all other tickets, by stamping time "Started" and "Stopped" on it, and filling in such information as is called for on the form.

Daily Non-productive Labor Ticket

There still remain for consideration certain phases of non-productive labor, i.e., labor spent on plant betterments, and labor on plant repairs. Labor on plant repairs is, of

course, non-productive, but is in a class by itself and is handled entirely apart from any and all labor that is regarded as strictly non-productive labor such as clerks, oilers, etc.

The ticket shown in Form 55 covers all non-productive work and should include all labor used in the factory not provided for by other tickets. Neither this nor any other tickets need be used for distinguishing non-productive employees who are at all times doing the same class of work. By this is meant such employees as clerks, foremen, storekeepers, oilers, window washers, etc., as the distribution of their time can be made from the "In" and "Out" time clock record. But this non-productive labor ticket should be used by all employees whose time may be divided between regular non-productive, productive, and betterment and repair work, such as millwrights, electricians, and ordinary productive employees who are occasionally engaged in non-productive work. These tickets are used the same as any other time tickets, by being properly stamped "Started" and "Stopped" and by having the information called for thereon filled in.

Plant Betterments and Repairs

In any factory there are from time to time plant betterments, that is, betterments made by the company itself. As these betterments form an asset to the company, they are just as much productive work as are the goods made for sale, and consequently the labor and material used must be costed up in exactly the same way. In order, however, that there may be no mistake in making distributions to such work, a separate order is provided, which, inasmuch as an authorization must be granted for making each betterment, is handled a little differently from a production order in issuing it to the factory.

Betterment Orders

These betterment orders are made out in quadruplicate, and should be numbered consecutively, and dated; in case a betterment order is issued as a supplement to a previous betterment order, the previous order number should be given after the "Supplement Number." The account to be charged, such as "Machinery and Tools," "Shop Fixtures and Fittings," etc., is to be given, and the authorization number, if any, together with the bill of material or requisition number. The date to be completed should also be shown. There should be given a complete description of the work to be done, together with a general specification of the materials required. (See Form 41.)

The original (green) copy of this form should be delivered to the department which is to do the work, and, when this work is finished, this copy should be sent to the chief stores clerk, who will enter his material costs on it and send it to the accounting department. The third (pink) copy is to be delivered at once to the chief stores clerk, who will deliver the material required for any betterment, upon presentation of proper requisition. The second (blue) copy of the order must be delivered to the drafting department for any drawings or other information which may be required for the carrying out of this order. The fourth copy (manila card) will be given to the accounting department as authorization for labor charges. When the work is completed, costs will be entered on this manila card, which is then turned over to the production department for recording purposes.

When work in the shape of a betterment is completed, it does not pass into component stores or sales as does a regular product made for sale, but "Work in Progress" is credited, and the various investment asset accounts are charged. If the betterment is for machinery bought and

installed in the plant, all the material, the machine itself, fittings, etc., and the labor of installing it, are charged to the betterment order, and the total cost in turn is charged to the "Machinery and Tools" account. If a betterment is for additions to a building, the betterment order will be charged to "Buildings" account; thus, it is taken out of "Work in Progress" and charged as an asset and is shown in the balance sheet every month, as provided for in the controlling accounts.

In order to get the monthly extensions for betterment orders, they may be entered under a separate heading, on the same sheet as is used for production orders, namely, the "Record of Production and Betterment Orders," which is described in Chapter XII. However, it is better to keep a separate monthly sheet for betterment orders, so that they will not be confused with production orders.

Daily Betterment Time Ticket

This form has been provided for the recording of all time spent on betterment orders. (See Form 52.) Each foreman whose workmen have occasion to do any betterment order work is provided with these tickets in pads, and, as soon as a workman starts on any betterment work, the "Time Started" will be stamped on this ticket, and the man's number, department number, and betterment order number are also entered thereon. Under "Description of Work" will be shown the nature of the work and the *department for which the work is done.* When the workman stops on this work, the time will be stamped on the ticket. These tickets must be turned in daily to the timekeeper after being O K'd by the foreman.

Plant Repairs

Plant repairs are authorized and carried out in exactly

the same way as plant betterments; that is, an authorization is obtained to do any extensive repair work and the repair order is then issued; but as all work of this nature is a general overhead expense, the material and labor used are charged to the proper account as provided for in the inventory classification of assets, and the total expense for work of this kind is charged to the same account at the end of the month.

A repair order form has been provided for making out orders to the factory for plant repairs. These orders are made out in quadruplicate and handled in exactly the same way as are the betterment orders, described above. (See Form 42.)

It is often the case that for several months few repairs will need to be made, and then in some one month a large amount of repairs may become necessary; therefore, instead of charging up the actual repairs as they are made, reserves for depreciation have been provided for all investment assets, such reserves being figured out on the basis of the estimated life of the investment covered. These reserves are charged into the general overhead each month, thus making for uniformity of costs. Then each month, as repairs are made, they are charged against these depreciation reserves. To illustrate, a machine valued at, say, $3,000 gets into such a condition as to require a complete overhauling at an expense of, say, $500. Now, it is obvious that it would not be fair to charge all of this expense to one month's operation, as the benefits derived from such repairs will continue for a long period. Therefore, the necessity for such repairs, even to the extent of completely replacing this $3,000 machine at a given time, must be anticipated. A monthly amount for such depreciation is credited each month into a "Reserve for Depreciation" account, and overheads charged. Whenever the actual repairs

are made, they will be charged to this reserve account, and labor and material credited accordingly.

The above method of handling repairs, for which provision has been made all the way through, cannot be too carefully carried out. It must not be forgotten that aside from the direct value of costs of operation, their comparative value is of next importance, and, unless such expenses are properly distributed, comparison of cost figures as between different periods becomes practically impossible. Extraordinary expenses for one month charged to the production for that month would throw the costs out so badly as to make them useless for comparative purposes.

Small Repairs

There are many small repairs throughout a plant that must be made from time to time without delay and without waiting for a repair order to be made out. The foremen of the plant should be instructed to use their judgment in such cases, but under no circumstances should they be allowed to make such repairs without issuing the proper workmen's time tickets and material requisitions, the same as for any other work. After the work is done, a formal order can be made out and issued, and the number of the order placed on these various tickets, so that the time-keeping and stores departments may properly handle them and have due authority for making the necessary distributions. This is something that must be very carefully watched, as foremen are prone to do much small repair work in time that is charged up to the regular product made for sale, and if this goes on to any great extent it can readily be seen how quickly comparative costs will be thrown out.

Daily Repair Time Ticket

This ticket (Form 53) has been provided for the record-

ing of time spent on repair orders. It is to be made out and handled the same as the daily betterment time ticket, and must be turned in daily to the timekeeper after being O K'd by the foreman.

Importance of Accuracy and Promptness

A careful study and the proper and prompt performance of the routine outlined in the foregoing instructions is, of course, absolutely necessary to obtain satisfactory results. Especially is this true because these matters are related to many others and are merely part of a whole. In order to have the whole organization properly co-ordinated and the entire production of the factory worked up to the proper standard, and also to secure the data necessary for maintaining this standard, it will be necessary for each department and every individual to carry out their part of the work promptly, correctly, and to the last detail. Those in charge should realize that if they allow any department to become inefficient or to fall behind, the proper working of the whole factory is affected, the final results in the controlling accounts are delayed and unsatisfactory and entirely lacking in those vital functions which are the reasons for their existence.

Cost of Production

While all the foregoing methods have been planned with the primary object of building up plant efficiency and developing production, they have, at the same time, been so laid out as always to obtain cost of production without the necessity of separate reports and "red tape" and without the installation of a highly specialized cost department. Yet, even if the expense of obtaining these costs was ten times as high as it usually is, it would be worth the price, for, after the work has been standardized, efficiency increased,

and costs reduced, it is only by a thoroughly dependable system that this general efficiency throughout the factory can be maintained.

All labor costs are collected in connection with, and on the same sheet as, the data for pay-roll purposes, as outlined in Chapter XI, "Employment and Handling of Labor." The material costs are collected and worked out in conjunction with the stores-keeping records, as outlined in Chapter IV under "Stores-Keeping," and with the record of production and betterments described in Chapter XII, "Distributions"; thus making the collection of cost records as nearly automatic as possible.

Supplementary Tag

It should be a rule that lots once started should never be split, yet emergencies will arise where an exception becomes necessary in order to keep assembly going. When such is the case, a red supplementary tag (Form 56) should be used for the "Split-off" lot. This tag shows the piece number, production order number, etc., under which work is being done, and shows the original lot number to which the quantity covered by this tag belongs, also at what operation it was taken, the date, by whom, by what department, and the reason for splitting. The balance of the operations and routing must be transferred to this tag from the original tracing tag (Form 43), thus carrying this quantity through to completion as part of the original lot and under its number.

Rejected for Scrap Tag

The "Rejected for Scrap" tag (Form 57) is to be filled out and attached to all pieces and parts that are rejected for scrap; that is, all pieces or parts that cannot be recovered by any subsequent treatment or operation. In every such

case it must be filled out in full with the data as captioned thereon.

Rejected for Defective Repairs Tag

Whenever rejected work comes from inspection in such shape that it can be recovered from rejection by applying certain repairs, the "Rejected for Defective Repairs" tag (Form 58) is to be used and the work is to be governed exactly by the captions on it, which, in nearly every instance, are self-explanatory. Both this tag and the tag "Rejected for Scrap" can be made to slip into a holder on tote boxes, or to be tied on material, as may be desired.

Symbolical Control Chart

A precise but simple method of giving instructions for handling papers and transactions in connection with any particular part of a business is very desirable. There is no clearer way to describe anything than by a chart, whether it pertains to general data covering some particular subject or subjects; whether it relates to an organization and its co-ordination or relationships, or whether it is in connection with the handling of papers, transactions, etc.

Graphic chronological charts which afford a very practical method of presenting data, have already been illustrated in Chapter IX (see Forms 38, 39), while in Chapter XII an organization chart (Form 76) is presented. There is still another type of chart which is of equal, if not greater, importance than the charts mentioned above, which can be called a symbolical chart. This, as illustrated in Form 59, shows the manner in which certain items travel from one point to another, together with any instructions they convey. This chart is presented in connection with a control board or planning system (Form 60) for handling work in which there is, as here termed, a central order sta-

tion, together with one sub-order station. Any additional sub-stations to be operated would, of course, be controlled from the central order station in precisely the same way.

This chart (Form 59) offers a simple expression of the routine work in connection with planning for order control and clears up all of the mystery that so often seems to surround this subject. The chart can be applied to the handling of all kinds of papers in connection with orders, mail, accounting, engineering work, etc. Any concern can devise its own symbology for such a chart. The key to this need be given to but few persons, thus insuring secrecy where necessary.

All manufacturing orders are for units of some kind, and these orders are broken up into production orders, (1) for pieces, and operations on pieces, and (2) for assemblies of pieces. The function of a central planning or order station should be the distribution of all orders by pieces, by operations on pieces, and by the assemblies thereof. Where the work is over a wide range of shop location, sub-order stations should be established according to geographical requirements, from which the work is to be timed "In" and "Out" to the men, the idea of the sub-station being to get a quicker distribution of the work by having the timing and control close to the workmen and machines. In other words, there is one general planning or order station for the whole establishment, but in addition thereto there are sub-order stations for the purpose of timing the work "In" and "Out" and controlling its progress. These sub-order stations will only control processing operations and the inspection thereof; while the *central order station will control directly, or through another sub-order station, all assembling, assembly, inspection, and tryout work.*

The chart given in Form 59 represents this in detail, together with a symbology which is almost self-explanatory;

in practice, the explanation of these symbols would not appear on the chart if secrecy was an object.

Briefly described, the central order station, shown near the bottom of the chart, receives from the production engineering department, as per "A," three blue-prints; one set of tool key cards; one set of tool set-up key cards; one set of fixture key cards; one set of unit key cards; one set of part key cards; one set of piece key cards; one set of operation key cards, and two copies of the production order. One copy of the production order, "B," is sent to the stock room as authority for the stores keeper to supply material, and is held there permanently in the file, with which in due time are placed duplicate requisitions. One copy of the production order, "C," is filed in the central order station and is held there as "work on order" until completed, when it, together with the signed tracing tag and blue-print No. 2 is returned to the engineering department. Blue-print No. 1, usually having been cut up, is destroyed and thrown into the waste basket, while the key cards as a general thing supply data for the routing and issuing of instructions from the central order station, and are consequently on permanent file at this point, as indicated by "A–1."

At the routing desk in the central order station, the order is broken up into pieces and operations on pieces, and from there routed in envelope "E" to the various sub-stations where the work is to be done, each envelope containing one blue-print, "E–1"; one instruction card (which is the same as a production ticket) for each operation to be done on the piece, "E–2"; one duplicate instruction card, "E–3"; a requisition to the general stores for material, "E–4"; a duplicate requisition, "E–5," and a tracing tag to be attached to the material, "E–6." This envelope is received at the control board of the sub-order station and from here the papers are distributed.

The original requisition for material, together with the tracing tag is sent to the stock room, as per "F," while the duplicate requisition is sent to the stock clerk of the sub-order station, "F–1"; the stores-keeper selects the material and attaches the tracing tag to it, and forwards this to the stock clerk of the sub-order station, "F–2." As soon as this is checked up by the stock clerk, and signed by him, the original requisition together with the duplicate is returned to the stock room, "F–3," and from thence the original requisition is sent to the accounting department, "F–4," and the duplicate filed in the stock room, while the rough stock is sent directly to the workman as per "F–5."

In the meantime, the workman's instruction card (production ticket), together with the blue-print, are sent to the workman who is to perform the operation, through the control board and time clock as per "G," and if the work takes longer than one day, a daily time ticket is made out and sent to the accounting department as per "G–1." As soon as the workman finishes a certain piece or quantity of pieces, the work is forwarded directly to the inspector as per "F–6," and a new ticket and new instruction card, together with a blue-print are forwarded to the inspector as per "G–2." When the work is completed here, the envelope containing the blue-print and instruction card is forwarded to the routing desk of the central order station, as per "E–7," where the blue-print goes to the waste basket and blue-print No. 2 is drawn out and forwarded with an instruction card as per "H" to the control board, through the time clock to assembly, as per "H–1"; and thence to inspection, as per "I," and thence to a try-out as per "J." After the work is completed in "J," it is forwarded as per "K" to the central stores, checked, signed for and the tracing tag sent back, as per "I," to the central order station. From here the copy of the production order, together with the second blue-

print and tracing tag, which came back from stores, are put in an envelope, "E–8," and returned to the engineering department, showing that the job has been completed for each individual piece or for an assembly of pieces.

In the routing of material, as can be seen by the broken line, it goes directly from the workman to the inspector, then to the assembly, then to the inspector, and then to the try-out, without physically being taken to the sub-order station or central order station, as this is in accordance with the routing of the tracing tag.

In connection with the central order station, at point "N" a line is shown whereby, if work on any particular job lasts for more than one day the daily time tickets are sent directly to the accounting department in the same way as they were at "G–1" in the sub-order station.

When the envelope "E" is sent to a sub-order station, it contains the instruction cards, one for each operation to be done on the piece called for; therefore, if there were ten operations it might go to ten different men before it was completed, being registered in and out at the sub-order station for each transfer; these registrations being made from the instruction card which is returned each time an operation is completed. On the outside of the envelope are printed a set of figures from 1 to 20, or more, as may be necessary, which are simply used to check up the operations done. That is, each time an instruction card comes back from the workmen, the operation number it represents, or the letter covering the operation it represents, is checked off on the outside of the envelope, so that at a glance the order clerk can tell how far along any particular operation has progressed. As soon as this check is made on the outside of the envelope, the instruction card is forwarded to the accounting department, as shown at "N–1" and "G–3."

There are, of course, any number of variations that

could be made in the foregoing chart; as, for instance, it might be better, even necessary, in some plants to send the tracing tags and requisition for material directly to the stock room instead of the sub-order station stock clerk, in which case the lines and the symbols covering these would be drawn accordingly. Or, again, the duplicate requisition for material might be destroyed, or might be sent to the accounting department, according to other systems that may be in use. In other words, the chart as shown is not a fixed and fast diagram for doing a certain thing, but rather an illustration of how systems and methods and routine work can be expressed in the shape of a chart, which in itself constitutes the instructions to the clerks and others employed on the various operations.

Planning Board

This board (Form 60) is made up of vertical units, so that it may be contracted and expanded from a minimum of 24 men to a maximum of 120 men on one set of supports. Further, the entire board is not only portable, but also adjustable, as it may be arranged at any angle desired from a vertical position to a horizontal position. Each unit has pigeonholes for 12 men. At the bottom of the unit are 12 spaces for men's names and numbers, and, in connection with each space, a hook on which to hang a brass check, which represents any machine the workman may be using, as illustrated by C and D in the small drawing showing a portion of a single unit. Each pigeonhole is numbered, the number of a pigeonhole being given for each man, as shown by E.

In order to know what machines are or are not being used, a machine board—entirely separate and distinct from the planning board—is used. This board is provided with hooks on which are placed brass checks for each and every

machine controlled by any one station or planning board. These checks should give not only the numbers of the machines, but also, by a symbol of some kind, its type or character.

Whenever a workman is given work and a machine is assigned to him for doing the work, the brass tag representing that machine is taken from the machine board and is placed on the pin under his name on the planning board, there to remain until the job is completed. In this way all brass tags hanging on the machine board will represent machines that are available for work, and the empty spaces will indicate machines which are in use. By proceeding in this way, the machine and the man are always brought together for each and every operation done, without having to post on the machine board the jobs that are on each machine, as is the case with most planning systems.

Round tags can be used for machines. If it is desired to post on the machine board the man's number on his being assigned a machine, a square tag should be used. In this way information regarding the distribution of workmen and machines will always be available by looking at the control board and at the machine board, and without in any way having to make a record in writing of just how work is distributed. Also, as many men do not work on machines, but are on bench work, this fact is shown by the absence of a machine tag on the planning board. In this way is secured a complete control of all men employed.

Whenever an order is made up for a piece or component, a large envelope, made to fit the pigeonhole in the control board, should be used in which to put blue-prints, material requisitions, tracing tag, and workman's instruction cards for all the operations required on the one piece. As these are needed they are distributed by sequence of operations to the workman in another envelope of the same size, and

a white slip containing a duplicate of the instructions given the workmen is pasted to the top of the original envelope so as to be visible in the workman's pigeonhole; the control board thus showing at a glance the entire distribution of work that has been given out. The envelope can be used several times by pasting one white slip over another. Consequently, the stock of the envelope should be fairly heavy and strong, without flap, and made permanently open at the end.

In case the work to be done is of such a nature that blue-prints or other bulky papers are not used, and the pigeonholes are simply wanted for instruction cards, material requisitions, tracing tags, etc., for work ahead, the pigeonholes would have to be proportioned accordingly, and in this case the white slip would simply be held on top of the pigeonhole by a small steel clip; any one of several kinds which can be purchased answering this purpose. These clips might also be used in connection with the envelope, if for any reason they should be preferred.

What has been said in regard to the order control chart also holds true here, as there are many ways of designing a planning board. From 60, as designed by the writer, has been presented here because it seems to combine to an unusual degree certain points of adaptability, simplicity, and labor economy in its use.

CHAPTER XI

EMPLOYMENT AND HANDLING OF LABOR

In which the handling of labor is considered from the time of starting to stopping, together with an approved method for paying labor and distributing its time.

CHAPTER XI

EMPLOYMENT AND HANDLING OF LABOR

Organization of Employment Department

It is the purpose of the present chapter to discuss the subject of labor somewhat broadly, but at the same time to give more particular attention to its relation to the accounting and statistical work.

Wherever possible, there should be an employment department or bureau which is to provide labor for all branches and departments of the factory. Furthermore, the responsibility of this department should be full and complete, and it should be a general rule that no one may be employed in the factory for any purpose whatsoever except through the employment department.

The employment manager should keep on file all applications for employment, all references relative to employees, and maintain a directory of these employees. In many cases he will also find it necessary to compile and have available information in relation to rooms, board, dwelling houses, etc.

In order to handle labor systematically from its first application to its final dismissal, a card record will be found convenient. A set of cards designed for the use of the employment department is presented in Forms 61-75. A detailed discussion of these cards follows.

Application for Employment Card

On this card (Form 61), designed to cover all general labor in the factory, may be recorded the various necessary

data in regard to the applicant. The cards should be filed by trade or occupation, that is, under "Machinists," "Blacksmiths," "Clerks," etc., so that, whenever a requisition for additional help is made, the applications of those capable of doing the required work may be readily located. When an employee is skilled in more than one kind of work, he should be indexed under all the occupations in which he claims to be competent, and the file number will be marked on the card, that is, the file number for reference to any letters of recommendation or correspondence that may be received in connection with an employee.

Letter Application for Employment

In order to provide for the higher class of employees, as for instance, high-grade office or engineering help, concerning which a great deal more information is required than for ordinary labor, a "Letter Application for Employment" (Form 62) may be employed. This letter application is self-explanatory in its purpose and use. It is usually double-folded to a 4 × 6 inch size, and filed as it is received, under occupation indexing in an ordinary card index drawer, the same as the application card.

As in the case of the employment card, the file number of any other correspondence or material relating to the particular application will be noted on the letter application.

Reference Inquiry Letter

This is a form of letter (Form 63) used in all ordinary cases for making inquiry of those given as references by applicants for employment. It is self-explanatory. Both this and the preceding letter form are made to double-fold to a 4 × 6 size so that, if desirable, they can be folded and filed in a card index drawer of this size.

Requisition for Help Card

This card (Form 64) is for the use of all division heads and foremen in making applications for labor. The face of the card is filled out in accordance with its headings by the party making the requisition. In each instance the card is made out in duplicate, the original being sent to the employment bureau, and the duplicate to the factory superintendent. On the back of the original requisition for help, in the columns provided for the purpose, the employment department records the names of men sent for, the date, and any comment. After men have been supplied, these cards may be temporarily filed in the employment department, under the names of the departments from which they come, as they show the authority for having hired the help so requisitioned.

It should be understood, as before stated, that all labor should be selected and hired by the employment department, and that, with rare exceptions, all general labor in the factory is to be hired and initial rate adjustments made without in any way being interviewed by foremen or division heads. Exceptions to this rule may be made in the case of such labor as is employed by letter application for employment.

Employee's Rate Card

As soon as the labor called for by a requisition is obtained, the employment department should make out for each employee an employee's rate card (Form 65). The employment department will also furnish the workman with an introduction card (Form 66) for presentation to the foreman to whom he is to report for work. The foreman will take up this introduction card, sign and return it through his division head to the employment department.

The employee's rate card provides for a running record

of any and all changes affecting an employee as regards wages, department, and clock number. It is sent to the factory superintendent or other division head for approval of rate and then to the accounting department for filing.

In every instance a day rate must be set for each employee, whether he works at piece-work or not. The reason for this is that—as is generally conceded—piece-workers should earn from 20% to 30% more on piece-work than they would on day-work; otherwise, there is no inducement for piece-workers to speed up. Ultimately a running chart on piece-work earnings, as compared to day-work rates, should develop information of this character. If, however, piece rates are so set that the piece-workers are running from 30% to 50% more than their day rates, piece-work rates have been wrongly set and the quantity of work that could be turned out has been misjudged. One unfortunate result of such a mistake is that piece-workers are likely to hold back so that excessive earnings shall not call attention to the error in piece rates, and the maximum output from equipment is not obtained.

Reductions of piece rates, when once these are established, are intensely discouraging to employees, tend to make them hold back, and have done more to bring the premium system into disrepute among them than any other thing. Because of this, piece rates should never be reduced after being once set, unless operation changes make it necessary. Day rates, however, may be changed to take effect twenty-fours hours after the employee is notified of the change.

To simplify the handling of the pay-roll, all employees, including piece-workers, should be paid each pay day on a day rate basis, and be paid on the first of each month the difference between the day rate and what has been earned on a premium or piece-work basis.

The employee's rate card is to be posted from the following cards in the order given:

1. "Change in Rate Card" (Form 67), which is used by division heads to notify the accounting department of a change in rate, the reason for the same, and the party authorizing it. These cards should be kept on file in alphabetical order in the accounting department, so that they may be referred to at any time for authority for any change and the amount in change of rate.

2. "Change of Department Card" (Form 68), which is used by division heads to notify the accounting department of transfers. This card, however, need not be kept after making entry on employee's rate card, as no purpose is served by keeping it on file.

3. "Report of Absentees' Card" (Form 69), which is used by the timekeeping department for keeping the foremen, superintendent, and others advised as to absentees. This information on these cards or slips is posted on the back of the rate cards where a record of each individual employee's absence is kept. The timekeeping department should be held strictly responsible for prompt notice of absentees to all interested persons both in the factory and in the office.

It is important that a rule should be made and strictly enforced, that if it is necessary for an employee to be absent, such employee must send notice to the employment office by telephone or otherwise, of his inability to report for work, and that if an employee misses five musters without sending such notice, he will be dropped from the pay-roll and not reinstated except by re-employment in the regular way. There are two reasons for this rule: if such notice is not given, a great deal of trouble can be caused by delayed work which the employee should have done, and, again, it causes trouble in making up the pay-roll, etc.

Quitting Card

The information contained on both sides of this card (Form 70), while of great importance to the company as a whole, is of particular importance to the employment department, as enabling it to judge of the stability of the labor employed and to recommend any changes necessary to correct evils in the handling of labor. It is therefore of the utmost importance that the information of the quitting card should be full and readily available. Not only is the employee's own reason for leaving wanted, but frequently, in addition, the opinion of some fellow employee as to why the employee left. An inspector's or foreman's opinion as to the reason for leaving is also provided for on the back of the card.

When a man is discharged, or quits for any reason whatsoever, one of these cards should be made out immediately by the head of the department under which he is employed, and all the information entered in detail as called for on the card. It is then to be sent to the office of the employment manager, where the man who is quitting will go for any adjustment or action necessary in his case. Instead of being allowed to leave, a desirable employee should be transferred to some other department or held in some other way, if this is possible.

As one of the most important questions in connection with labor is its stability, an employee should never be allowed to leave a company without full data as to the reasons why he left. Oftentimes, the company may be at fault, through its division head or foreman rather than the man who leaves; consequently, the causes that lead to an employee's leaving are always a question for serious consideration. Unfortunately, it is necessary to allow foremen or division heads to discharge men from their departments; otherwise they could not maintain discipline. The

employment bureau must act as a clearing house for such discharges. Foremen, knowing that under this method, in case of a dismissal, they as well as the man discharged are subject to investigation, are much more careful and just in their attitude toward labor.

Records invariably show that labor is less stable under some foremen than it is under others. Records will also show that often men are put on work they are not fitted to do; whereas, if they were shifted to some other kind of work, they would render satisfactory service. Therefore, all the information called for on the quitting card should be supplied, and before an employee can draw his money and actually be let out, the information on this card should be analyzed by the employment manager and the man handled according to his findings. It may be possible to put the man to work at some other point. It is always understood, of course, that before the man is paid off, information must have been received that all tool checks and other charges against him have been turned in and taken care of.

Employees Dismissed and Resigned

So much importance attaches to the record of employees quitting, that it should be utilized to make out the "Monthly Record of Employees Dismissed and Resigned" (Form 71). These records give for each month, with reasons, the number of employees leaving. If employees are leaving because they are dissatisfied, it is certainly a serious thing for the management, and statistics are needed giving the causes of dissatisfaction. On the other hand, if a large percentage of employees leaving are undesirable employees, there is something wrong in the method of the employment department in the hiring of labor. Again, if employees leave for other positions, it is quite evident that the other concerns

are offering better inducements. In other words, this record gives the data for analyzing all of the changes which take place in the personnel of labor.

Pay Period

If possible, a four-times-a-month pay system should be installed instead of a once-a-week system. The principal reason for this is the saving of clerical labor that will be effected in handling a pay-roll at the end of the month in order to get a monthly statement of profit and loss. In other words, when employees are paid once a week, it nearly always brings the end of the month in the middle of a week, which necessitates carrying an extra account in the ledger and it also involves the figuring up of one week's work two different times to get the distribution, thereby causing a great amount of extra clerical labor. This applies both to non-productive labor, which must be prorated over production orders, and to the productive labor itself.

Under the four-times-a-month pay system proposed, the pay days may be set somewhat as follows:

On the	4th,	up	to	and	including	the	31st	
" "	12th,	"	"	"	"	"	8th	
" "	20th,	"	"	"	"	"	16th	
" "	28th,	"	"	"	"	"	24th	

This arrangement allows four days after the close of each pay period for making up and checking the pay-roll, which is usually a sufficient time to do the work properly and accurately.

All employees in a factory, except foremen and department heads, should be put on an hourly basis, and paid for the actual number of hours they work. All office employees, foremen, and department heads should be paid on a monthly basis, and paid in four equal payments each month. This

very much simplifies the making up of a pay-roll and all subsequent distributions.

Time Card

The time or clock card (Form 72) should be used for keeping the daily time of all employees. They are required to ring "In" in the morning and "Out" at noon; "In" at noon and "Out" at night; "In" for extra time and "Out" for extra time. The record of all this is provided for on the card, each card showing also the pay period and the time it covers.

Each card should bear the name of the employee, and all payments made by the company should be controlled by the time registered thereon, except in the case of piece-work or premium work.

A timekeeper should always be at the clocks when employees are ringing "In" and "Out," and it should be the timekeeper's duty to see that the clocks, card racks, etc., are kept in order, and that the clocks are kept on time. As soon as all employees are in in the morning, the head timekeeper should have all time on clock cards sent to his office and there enter them on a time sheet (Form 73) for the time registered by the clock on the previous day.

At the end of each pay period these time cards are used for making up the pay-roll. The total amount of regular, overtime, piece-work, and premium work, shown on the time sheets, is entered in the spaces provided for the same, and the cards are then handed to the paymaster or treasurer, who will have the pay-roll made up, deducting any advances and entering these advances on the card, so as to show the kind of pay which the employees receive, as well as the total. Each time card should bear the number of the time sheet from which the amount paid is taken. (See also Form 73.)

Pay Check

It will be noticed that a detachable pay check (Form 72) is provided with the time card. When new cards are put in the racks at the beginning of a pay period, the date the pay period ends and the employee's number are inserted upon each pay check, the same as on the main part of the time card itself. When an employee takes the card out of the rack for the first time, he tears off his pay check and puts it in his pocket, thus having a means of identifying himself at any time he is called upon to do so; and it should be a rule that any man in a shop who cannot produce his pay check should be immediately challenged as to whether or not he is an employee of the company.

On pay day each employee should have his pay check ready, signed with his name and address, and when he receives his pay must pass it in as a receipt. If a premium system of payment is adopted, the premium earnings may be put in a red envelope, in which case the employee will sign once for his regular envelope and again for the premium. This red envelope is quite a feature as it calls the attention of the other workmen to the fact that an employee is earning a premium, and usually creates an interest in premium work and an anxiety to have their own work put on a premium basis.

After payment has been made, this pay check is pasted on the back of the time card where the word "Instructions" appears, with the signed side up and in front, and the entire lot of time cards with these checks pasted to them is fastened together and filed away for future reference in auditing.

If an employee should lose one of these pay checks, it will be almost impossible for anyone finding it to draw his pay if it does not show the owner's signature and is not identified by his foreman. Pay checks presented outside of

pay day should be challenged for this information. Further, a comparison of signatures with previous checks would immediately indicate a forgery, if one was attempted. Employees should not sign their pay checks until the morning of pay day, thus making it impossible, if one is lost, for a chance finder to get it cashed.

Time Sheet (First Form)

The purpose of keeping a time sheet such as that shown in Form 73 is much more than the mere collection of time for pay-roll purposes. Primarily it does this, but, while keeping it for pay-roll purposes, the information gathered is also available for other purposes far more important. First, it affords a check on the factory against the "In" and "Out" time clocks; and second, a complete record of each employee's time for each pay period is secured, showing how this time has been disposed of; third, a record is made that will act as a labor distribution sheet, and from it can be compiled all statistics and costs relative to the amount and the time expended on the different kinds of labor, namely, day work, extra time, piece or premium work, non-productive time, and waiting time; and finally, it provides a completely self-balancing and self-proving record, which will immediately show any errors in turning in or in posting time tickets, so that such errors can be checked up and rectified before matters become "cold" and before it becomes impossible to locate discrepancies. As the figures computed for pay-roll purposes are the same figures used for distribution data, the time sheet proves itself, and at the end of each month the total amount expended for labor must balance out exactly with the total labor distribution.

The time sheets illustrated in Forms 73, 74 are therefore capable of being used for:

1. Checking workmen's daily time tickets and slips (see Chapter X) against the clock time.
2. Providing a distribution of each workman's time according to the department number in which he is working, and the activity or kind of labor at which he is employed in that department.
3. Furnishing a complete system of costing of labor on all production at the same time that the time for pay-roll is extended.

Two of these sheets, which are printed on both sides, are to be used for each employee each month. One side of the first sheet provides for keeping the time from the 1st to the 8th of the month, inclusive, and the reverse side, from the 17th to the 24th inclusive, while the other sheet provides for keeping the time from the 9th to the 16th inclusive on one side, and from the 25th to the 31st inclusive on the other. This arrangement enables the timekeeper to enter the time from the time cards and workmen's daily time tickets on the current time sheet, and leaves the sheet for the previous pay-roll available for figuring extensions and computing the pay-roll separately. At the same time, it gives on each sheet the total pay for the period, and on the last sheet of the month, monthly grand totals for each employee, thus giving the fullest data which can possibly be required without going to the expense of re-compiling figures for statistical purposes, etc.

As stated under the description of the clock or time card (page 207), each morning the time on the time card is to be entered at the top of the time sheet, and against this time will be checked workmen's time tickets coming in from the factory each day. Provision has been made on this time sheet for entering the hours and minutes only from the workmen's daily time tickets. This requires an extension of the amount in money but once for the entire pay

period, thus saving a great deal of time, computation, and extension work.

When the workmen's daily time tickets (Forms 44-55) come in each morning for the previous day's work, the timekeeper first sorts them by the employees' numbers and posts to the time sheet. For all tickets showing operations on any production, betterment, or repair orders, the "Order Letter," "Order Number," and "Operation Number" should be entered in the first three left-hand columns of the sheet, and the space in which they are entered between the heavy cross-rulings is left for the same order for the entire pay period, i.e., the information on the particular order for the pay period is entered entirely across the sheet.

To illustrate, if a workman's first time for the period comes in showing part of his time on production order No. 500, operation "A," then the order letter "C" ("C" for production, "E" for betterment, and "F" for repairs) will be entered on the first line of the sheet in the first column headed "Order Letter"; under "Order Number" will be entered "500," and under "Operation Number," "A." Then will be extended under the proper date the number of hours and minutes shown by the time ticket, which will be entered on the line showing the kind of work, i.e., day work, overtime, piece-work, and premium. If the same order is worked on again in the period, it is entered on the same horizontal lines but under the proper date as the first time. If the remainder of the first day is spent on betterment order No. 100, in the next space between the heavy horizontal lines will be entered E Order No. 100, and the hours and minutes entered in the column under the same day and on the day-work line.

As the workman goes on working from one production order to another, the order number will be entered in the next vacant space between the heavy cross lines, and all of

the time for the pay period spent on such order number will be entered between these same heavy lines, so that at the end of the pay period, by adding across the page, the total time spent on each production order is obtained, together with the total cost of each operation on each production order. Space has been provided for posting the time on twenty-one different order numbers in each pay period. Usually there will be a less number than this, but, in case there should be more, a separate sheet can be kept for the additional orders and filed in a binder directly behind the first sheet.

Under each date in the "Ticket Number" column of the time sheet should be entered whatever additional number there is to the time ticket other than the production order and operation numbers; that is, all tickets on production orders are to be numbered with a combination of the production order number, operation number, and lot number. Therefore, as the production order number and operation number are given in the left-hand column on this sheet, the only remaining figure to be put in under "Ticket Number" will be the lot number.

When a workman turns in a time ticket for non-productive labor (Form 55), the ticket number and the hours and minutes shown on the time ticket should be entered on the lines provided for that purpose near the bottom of the time sheet. This also applies to waiting time, provision having been made for two waiting time tickets (Form 51) in any one day.

It will be seen that, adding down the entire column under each day, the footing obtained is the workman's total number of hours and minutes for that day, and this total *must* agree with the total clock time. If any discrepancy occurs in this respect, the matter must be taken up by the timekeeper with the foreman or superintendent, and he

must see that tickets are turned in for the entire time shown by the clock.

The hours and minutes on piece-work must be entered on the time sheet daily, just as for day-work. When the first ticket for certain operations on piece-work comes in, the timekeeper will enter, in the "Order Number" column directly underneath the number of the order, the piece rate in red ink, and when he posts the hours and minutes he should also post directly below this in red ink the number of pieces processed at this operation. In this manner, at the end of the pay period, the total number of pieces processed can be extended in red ink in the same column with "Total Hours," and the piece-work earnings can then be entered on the proper line in the column "Amount Day-Work."

Premium earnings should be handled in the same manner as piece-work, entering them in red ink directly above the premium hours. The "Bonus" column will be used, of course, only in case of premium work, when the premium bonus will be shown thereon. The "Total Pay" will be entered in the last column.

At the end of a pay period this sheet is transferred from the timekeeper's active binder, the other sheet being used meanwhile, as it is then ready for figuring extensions. This should be done on a calculating machine. When the sheets are extended and the footings obtained, the amount of time together with the money it represents, as shown on the time sheets, should be carried to the laborer's time on clock card (Form 72) for that pay period.

After extensions have been made for pay-roll purposes, a recapitulation of the total hours and costs of each production, betterment, and repair order, and of all non-productive work and waiting time, are drawn off, and at the end of the month the totals are turned over for distribution work.

It will be seen that these time sheets afford a complete and clear record of each employee individually, and of all employees collectively, as well as giving complete cost data for all labor employed on each order going through the factory.

It should be noted, that at the top of the sheet, not only are the employee's name and number given, but also the department number and the activity, this activity meaning the classification of labor, such as day-worker, piece-worker, premium worker, clerk, non-productive day-worker, etc., the timekeeper being given a classification number for each of these by the distribution department.

In posting the daily time tickets, each should be checked with the department number as shown at the top of the employee's time sheet, and, if the time ticket shows that he is working in another department, such time must be entered in a space between the heavy cross-rulings, in the first column of which will be entered "Charged to Department ....." Thus, at the end of the month the total of such time spent in other departments can be charged to the proper department, and not be shown in such employee's regular department, as would otherwise be the case.

Distribution of Labor Costs

When the timekeeper receives notice of the completion of any production, betterment, or repair order during the month, he will immediately obtain from his time sheets the recapitulation of the labor cost of such order and turn it over to the distribution department; and at the end of each month the totals of all unreported production orders, non-productive labor, waiting time, and every other classification of time, will be turned over to the distribution department, thereby furnishing it with the complete distribution of the entire pay-roll for the month.

In turning over labor costs on orders completed during the month, notation should be made on the time sheet, so that the costs of these same orders will not be included in this distribution report at the end of the month.

In addition to this, there will be drawn off at the end of each month the total of labor charges to each department, and to the classification of activity of such labor in each department, as per the "Labor, Material, and Expense Distribution Sheet" (Form 77); that is, the total labor for each department will be given according to the distribution numbers, as set forth in Chapter XII, "Distributions."

Time Sheet (Second Form)

A second method of timekeeping is hereby offered for consideration, which is somewhat simpler than the one previously described, as, in so far as the time sheet is concerned, it confines itself to pay-roll purposes only. The time sheet illustrated (Form 74) provides for four pay periods per month, as in the previous case, and also provides for the registration of the time or clock cards (Form 72) and of the internal tickets, whether for day-work, overtime, or simply piece-work. In this system the clock cards are gathered every morning, and the hours and minutes only are posted to the proper column. Then, if an internal ticket is provided for each and every employee, it is posted to the column "Regular," "Overtime," or "Piece-Work," as the case may be, space being allowed for three different piece-work tickets each day.

Extensions on this sheet for day-work are made but once a pay period, and can be made for piece-work once a pay period or once a month, according to the policy established for handling piece-work. That is, in some factories it is found desirable to pay men on a day rate basis for the entire month and then once a month pay them

any additional amount they may have earned on piece-work. In other words, the difference between the "Total Piece-Work" column and the "Total Day Wages" column, as shown at the end of the month on this time sheet, gives in such cases the additional amount earned by piece-work from pay period to pay period during the entire month.

It should be borne in mind that this time sheet serves no other purpose than pay-roll requirements and that all distributions by departments and by production, betterment, and repair orders must be made entirely independent of it.

For distribution, when this sheet is used, reference is made to the departmental distribution sheet shown in Form 77, in which the account numbers run across the top of the page and the department numbers vertically on the left-hand side. A very simple method of distribution of time tickets and clock cards can be made by sorting all tickets to a set of pigeonholes made to correspond to each one of these departmental distribution numbers; that is to say, each department number, plus an account number, should constitute a pigeonhole. During the month, all time tickets and requisitions are extended and placed in these pigeonholes according to the department from which they come. At the end of the month, by simply using an adding machine and entering the totals on the distribution sheet, a departmental distribution is obtained. After this, all tickets and requisitions, covered by a production, betterment, or repair order number, are sorted by these numbers, and the adding machine is again brought into use and the total of each order number is placed on the record of production, betterment, and repair order sheets (Form 78). This affords a simple but complete method of obtaining the pay-roll, the departmental distribution, and the production, betterment, and repair order distribution.

This method can be simplified still further, if necessary,

by reducing the time sheet illustrated in Form 74 to a record of piece-work earnings only, paying off on the basis of the clock cards each week at the day rate, and at the end of the month paying the difference between day earnings and piece-work earnings.

In order to explain better this last method of handling the pay-roll, a time or clock card based on a weekly pay period and somewhat different in its construction from the one previously illustrated, is shown in Form 75 and discussed under the next heading.

Time Card (Second Form)

Every employee of the company, in the office as well as in the factory, whether a division head, foreman, or otherwise, should, without exception, use a clock card (Form 75) for keeping his daily time. Time clocks should be installed throughout the works, each one or more at the same point being called a "Timekeeping Station"; and, in assigning a clock card to an employee, the station number should be indicated on the time card, as should also the number of the department in which he works.

It will be noted that these clock cards cover a period of seven days, on the assumption that all payments are made on a weekly basis, and the total time of each day is footed up at the bottom of the card.

With all work throughout the factory that is to be covered by a production, betterment, or repair order, a time or cost ticket bearing the number of the order will be used. On the clock card will be noted a checking line "Ck" just below the "Total" line at the bottom of the card. In this the time for any particular date as shown on the cost cards in the factory, can be entered as a check on the total time. For instance, if a man's clock time shows up for eight hours, and his internal time on the cost card shows

up for only seven and a half hours, there is a difference of thirty minutes to be accounted for, which may be charged up to waiting time if necessary. If this is done, at the end of any pay period or at the end of a month, if found desirable, statistics can be made as to this waiting time. Or again, as is done in some factories, if internal time tickets are issued each day for each and every employee, this bottom space on the clock card can be used to check up the man's time, as between "In" and "Out" time, and internal time.

When the time for the week has been duly entered on the clock card, the activity of the employee, whether he is a foreman, laborer, or clerk, as shown on the distribution sheet, is indicated on the clock card, and the entire distribution of labor can then be made from these clock cards so far as departmental distributions are concerned. In other words, much of the information that is compiled on the time sheet in the method previously discussed, is here tabulated on the clock card, this card having vertical columns for registering time, instead of horizontal columns.

At the end of each pay period, the clock cards are to be used in making up the pay-roll. The total amount of regular, overtime, and piece-work earnings having been entered in the spaces provided, the cards are sent to the accounting department for the making up of the pay-roll. The cashier will deduct any advances by entering them on these cards so as to show the net amount of pay the employee is to receive, as well as the total.

Regular time and extra time on day-work will be posted direct from the clock card itself, while piece-work earnings will always be posted from sheets, as before suggested. By this process, it becomes absolutely unnecessary to make up any pay-roll sheet, thereby doing away with a great amount of clerical work and liability to error.

CHAPTER XII

DISTRIBUTIONS

Illustrating the relations between organization and accounting work, and showing how labor, material, and expense are distributed to both departments and orders.

CHAPTER XII

DISTRIBUTIONS

Organization

Ordinarily, the organization of a business is understood to be the uniting of a body of individuals together by bringing its personnel into systematic connection and co-operation as a whole, or, in other words, to prepare for the transaction of business by electing and appointing officers, committees, and others, who are to be vested with authority over the various departments, so that each will properly correlate and co-operate with all.

This conception of organization, while correct, is incomplete as it omits the prime consideration in designing an organization. The things to be considered first in any manufacturing business are its functions and activities, irrespective of the individuals to be connected with it; that is, it is the designing of a machine which, after completion, must be manned.

Fundamentally, the division of a manufacturing business into departments is the basis for its organization, as the different methods of procedure in the different departments require widely varying experience on the part of departmental heads, just as varying experience is necessary in the processing of different kinds of material on the part of the labor employed.

The primary organization of a manufacturing business, therefore, is its division into such departments as are required by the different experience demanded for their opera-

tion, and then the appointment of a competent personnel to operate these divisions.

Organization, like everything else, goes by assemblies and sub-assemblies; in other words, in any organization as a whole there are many units of organization. For instance, all the purchasing work is a unit, as it takes a kindred line of experience and knowledge in all of its various branches; the same applies to accounting work, selling, etc. Therefore, the first thing to do in forecasting an organization is to determine what these prime divisions or units should be—thus:

Administrative Work covers (1) finance, (2) investments, (3) insurance, etc.

Selling Work covers (1) advertising, (2) selling, (3) collections, etc.

General Accounting Work covers (1) billing, (2) general bookkeeping, (3) balance sheets, profit and loss statements, etc.

General Office Work covers (1) correspondence and typewriting, (2) mailing and filing, (3) general supervision, etc.

The above relates more particularly to the commercial end of a business. In the manufacturing end, under a "Factory" or "Works Manager," there would be:

Purchasing Work, covering (1) buying, (2) receiving, (3) general stores, etc.

Engineering Work, covering (1) designing of product, (2) designing of plant preparation, (3) planning work, etc.

Plant Service Work, covering (1) power and power appliances, (2) millwrights and installation work, (3) water, steam, electric, and general plant service, etc.

Processing Work, covering (1) tool-making, (2) processing product, (3) equipment maintenance, etc.

Factory Accounting Work, covering (1) time-keeping and pay-roll, (2) costs and statistics relating thereto, (3) inventories, etc.

Shipping Work, covering (1) shipping, (2) warehousing, (3) transportation, etc.

The foregoing, a rough classification of the functions found in almost any manufacturing business, is given here to bring out the basic principle of organization, i.e., the fact that departmental creation is determined by the varied abilities or experiences of labor required to operate and control the factory activities.

For a manufacturing business, the classification given is fairly representative, each prime function embracing only such activities or experiences as are closely related and similar. In other words, a clerk in the office would not be expected to do tool-makers' work, or vice versa.

Organization Chart

While organization is no part of the present discussion further than it affects the accounting or system of distribution, nevertheless a chart (Form 76) is given, illustrating a fairly representative organization and grouping functional activities, with an arrangement of authorities that is almost self-explanatory.

In so far as the officers are concerned, their particular functions are clearly shown on this chart, for the treasurer should be, *in fact*, not in name or by in proxy, in charge of all questions relating to finances and accounting, and the secretary should be, if possible, in charge of all matters relating to the general office work, etc., in addition to his legal duties as secretary of the corporation. So also, the best

form of organization seems to be that which makes the vice-president of the company its general manager, as it gives him close working relationship with not only the activities of the business, but the finances, policies, etc., that control these activities.

It is not, however, so much the relationship of authorities that is of interest at the present moment, as it is a distribution of expense over an organization, made in such a way that direct responsibility can be placed on each department head for the expenditures of his department. For example, either one of the commercial expense groups shown on the chart (Groups 11 and 31) may be taken and it will be quite possible to lay out a distribution sheet reflecting the cost of this organization.

Factory Overhead Sheet for Distributions

The handling of production under engineering supervision has, during the past few years, made changes so rapid and so radical in accounting methods as to have, in large measure, completely transformed them. For example, cost accounting has become so closely identified with production engineering or planning department work that in many lines of industry it must be considered a part of such work.

The keen competition of today will not permit of distributions of labor, material, or expense, either individually or collectively, being made promiscuously or without reference to departments. An excellent illustration of what modern business methods demand will be found in the factory overhead sheet for distributions (Form 77), wherein are shown three divisions of overhead expenditures, namely, labor, material, and expense, each divided into a certain number of captions. Labor shows four different kinds of activities; and materials, five different kinds of commodities; while under expense there are seven different classifications. More

subdivisions may be made if necessary. All of these are governed by account numbers, the Dewey decimal system being used in the present instance. All of these numbered captions are used later at the time the monthly balance sheets are drawn up.

On the left-hand of the sheet is a complete division of the business into departments, numbered according to the Dewey decimal system. Thus, each department is designated by name and number, a combination of the latter with any account number constituting a symbol for distribution. To illustrate, 16–1.2 would be the clerical work in the bookkeeping department, while 97–1.1 would be the foremen in the wheel department, or 97–1.3 would be general non-productive labor in the wheel department. Or, again, 81–1.2 would be the general non-productive labor in the experimental room, and so on for any and all other combinations of departments and accounts numbers, the symbol always being the number of the department plus the account number of either labor, material, or expense.

By this method a complete analysis of departmental overhead is obtained for the entire plant in such a way that comparisons can be made from month to month. What is more important still, these can be made in such a way that the personnel of an organization can be held directly responsible by departmental divisions for any variations due to the excessive use of labor, material, or expense, in so far as they may have any responsibility for it.

One great purpose of creating a combination symbol composed of department and account numbers, is to make possible the use of modern accounting machines, such as the Hollerith or Powers machines, for distribution work.

It must be borne in mind that the important and real purpose in connection with the ascertaining and distribution of overheads, is to show their percentage or hourly basis

relation to the amount of productive or direct labor employed.

By this method of distribution, the total direct labor of a plant can be checked against the total overhead and a common percentage or an hourly rate obtained. The latter is much to be preferred when it can be worked out, as it furnishes a fairly close cost on any unit manufactured where a factory is operating on what is known as the continuous manufacture basis.

It is highly desirable, however, in laying out any system, to have it so flexible that, if found necessary, the same relation between direct and indirect expense obtained as a whole may be had for each department. Provision has been made for this on Form 77. On this the total amount of direct labor for each department will be shown in Column 4.2 and a means thereby afforded of ascertaining departmental overheads by amounts and percentages which will enable them to be worked out ultimately on an hourly basis.

It would be quite possible to give a more detailed analysis of overhead, but it seems hardly necessary. Labor divided into foremen, clerks, manufacturing, and trucking or general, would seem to be a sufficient division for the control of labor conditions especially where it is segregated by departments. The same may be said of the divisions given for material which are sufficient for almost any business.

Old methods of accounting employed a large list of standing orders, some of which related to labor, some to material, some to a combination of labor and material, and most of which upon analysis lacked any possibility of placing direct responsibility for their variation from month to month and year to year. Modern accounting has entirely eliminated this system of standing orders. In the first place the elements of manufacture have been reduced to three primes

—labor, material, and expense; therefore, all accounting work is designed to deal directly with these three items for whatever purposes it may be necessary to apply them. The method of distribution as illustrated above takes full cognizance of this condition in its separation of producing from non-producing factors for purposes of administrative control.

In Chapter XIII, "Commercial or Office Accounting," and Chapters XIV, XV, "Controlling Accounts," it will be shown to what a great extent factory accounting has been effected by a recognition of these three primes. For instance, such things as labor, materials, and other distributions to standing orders, were formerly made by a voucher record or cash book, and were a matter of bookkeeping. Today, no such thing as distributions of this character are recognized in connection with general bookkeeping, but they are taken care of altogether by cost accounting, and this cost accounting is always protected by the issuance of some kind of an order for the work required, to which must be charged the labor, material, and expense involved in its execution.

The following is a brief discussion of the various headings on the distribution sheet, classified in accordance with the arrangement of the sheet:

Labor

Account 1.1—Foremen. This should cover everything requiring the attention of the general foreman, foreman and assistant or sub-foreman, in every department.

Account 1.2—Clerks. All clerical work of any kind, including stenography, typewriting, and general office routine in any individual department throughout the factory, should be charged to this account.

Account 1.3—Manufacturing. Under this caption should

be entered any and all non-productive labor used throughout the factory for any purpose whatsoever in any department which is not registered under 1.2 or 1.4.

Account 1.4—Trucking. As the expense for trucking in a large plant is usually a considerable item, it is advisable to set this up as a separate account called "Trucking," even when the charges originate through an organized transportation department.

The expense is then distributed over the various departments in accordance with the facts.

Column 1—Total. This is the total of all indirect labor for each and every department, by activities, and it is to be checked against Column 4.2—Direct Labor—between direct and indirect labor.

Materials

Account 2.1—Shipping Supplies. Supplies of this character are chargeable to very few departments, probably not more than three or four for most businesses. The heading covers nails, screws, lumber, excelsior, burlap, paper, crates, etc., that are used exclusively for the purpose of shipping.

These are separated from other non-productive materials because they are not consumed in factory operations, but are necessary to transportation of goods after the factory has got completely through with its processing or assembling operations. These items, therefore, are not considered a part of factory operations at all, simply a warehousing expense which might well come under sales expense. Usually, however, they are treated as a part of factory overhead.

Account 2.2—Operating Supplies. Charged to this account will be such items as are consumed in operating the plant itself, and must necessarily embrace many small items. In other words, it represents material that in no way enters

into a product manufactured for sale or a product resulting from betterment orders; something that is consumed without being in any way directly chargeable to an order of any kind; such as waste, cutlery compounds, emory wheels, polishing materials, etc., as shown in stores classification of same. It should, therefore, be absorbed into the product through overhead.

It is in view of these distributions of materials that the classification under stores-keeping has been so specifically itemized, enabling the accounting department to know just what materials are to be distributed to such accounts as this. In the development of stores-keeping no attention has been paid to these necessities until quite recently.

Account 2.3—Miscellaneous Equipment. A considerable explanation is required in connection with this distribution account. Miscellaneous equipment includes such items as files, hammers, wrenches, drills, tanks, barrels, flasks, trucks, fire buckets, brooms, mops, pails, etc., and in addition thereto, a large proportion of small cutting tools of all kinds which have been issued to the factory, all of which are items carried in general stores for expense consumption. They are not classed as fixed assets, being short-lived, but they always have a residue value in them upon the taking of a physical inventory.

For instance, an inventory might show five dozen half-inch twist drills, partially used, and they would be put into physical inventory at some valuation and carried into inventory account as described in Chapter XIV, "Chart of Controlling Accounts." During the year, however, there might be ten dozen of the same sized drills issued to the factory which would have been charged up to expense or overhead, and yet at the end of the year practically five dozen half-used drills of this size might be found. Therefore, it is obvious that there is always a standing investment in items

of the character described above, which have a recognized inventory value for a going business. Beyond this, as everything of this nature goes into expense, that is, the amounts consumed from year to year during inventory periods, it must be understood that all such items issued from stores to the factory do not at once go to increase the controlling accounts, but any increase or decrease in assets of this character will have to be recovered upon the taking of a physical inventory, and the figures shown by this physical inventory will stand as the investment for the next succeeding year.

Account 2.4—Fuels and Lubricants. This account relates to any and all kinds of manufacturing fuels, whether gas, oil, or otherwise, that may be used by various departments and which cannot be charged directly to any production or betterment order; also any and all lubricants used for operating machinery of any kind.

Account 2.5—General. This account covers any and all items not otherwise chargeable to an order of any kind or to the previous four captions, and naturally would include all office stationery, forms, etc., used throughout the factory.

Column 2—Total. This column is the total of all materials used as classified by departments.

Expense

Account 3.1 — Monthly Depreciation. This account covers the total depreciation shown under reserves (See Chapter XV, "Chart of Controlling Accounts"). It can be worked into a schedule for each department if it is desirable or necessary to do so in order to obtain more accurate departmental overheads. The basis for such a schedule would be the square foot floor space occupied, plus the investment of equipment contained thereon; otherwise,

the depreciations would simply be shown in this column as total and be taken into overhead as such.

Account 3.2—Monthly Insurance. This account should show an aggregate of all insurance which is to be absorbed into overhead on a monthly basis, and it should cover every class of insurance as carried on the current ledger accounts. In other words, the total insurance applied to the plant should be prorated monthly, and the amount shown in this column in total.

Account 3.3—Monthly Rent. If any buildings or property are rented for the use of the factory, this account provides a means for distributing the rental to the departments occupying such buildings or property; but if cost in the form of rental is charged for the entire real estate and buildings of the company, a means is obtained whereby the square foot floor space occupied by each department can be charged proportionately.

Account 3.4—Electric Current. The same opportunity is offered here for arriving at the lighting expense of each department if proper meter arrangements are provided to do this. Provision is also made in this account to cover any and all power used by the departments, either individually or collectively, provided proper meter arrangements are introduced for obtaining the consumption of same. To this end it is to be hoped that the power plant will be run as an independent unit and that all current for light and power will be metered to each and every department; otherwise the expense of the power house will have to stand as an undistributed overhead to be prorated on some other basis.

Account 3.5—Taxes. This account covers the distribution of a monthly prorated amount of taxes and must embrace not only the real estate and personal property taxes of the company, but also any corporation or other taxes

that should properly be distributed over the product manufactured, by an absorption into overhead.

This distribution account is related to the controlling account "Taxes Accrued," and consequently has a prorated distribution table in accordance with the demands of this account.

Account 3.6—Freight and Express. This account relates to the incoming freight and express on all goods of which there would be very little departmental distribution, the principal amounts being charged up to general stores, power plant, etc.

Account 3.7—Overhead Unclassified. This account is for the collecting of such items as could not very well be distributed to any of the foregoing accounts. It might embrace contract work for window-washing, janitorship, or cleaning of buildings. In other words, this provides a special column for things that are not regularly applied to overhead or could not be classified in any other way.

Column 3—Total. This column is the total of all expense which goes to create overhead for the month and is shown by totals for each department.

Column 4.1—Grand Total. This includes the grand total overhead expense of each department together with the grand total of all overhead for all departments.

Column 4.2—Direct Labor. This column is provided for statistical purposes only, to permit of ready comparisons between direct and indirect labor, and is not to be treated as an account in any way.

Redistribution

Bearing in mind the fact that there are two kinds of overheads—those which belong to each individual productive department, and also the general overhead or expense of all non-productive departments which must be prorated

over productive departments—it becomes necessary to make a redistribution of the latter to the former.

Column 4.3—Prorated Overhead. In this column will be placed a redistribution of all general overhead, according to the percentage of the direct labor for each department as shown in Column 4.2. In some instances it is considered more conservative and more equitable to prorate over the productive departments according to the overhead of these departments than to just the productive labor, principally for the reason that there are less variables for these departments on overhead charges than there are for the productive labor. Column 4.2 added to the overheads shown in the productive departments, Column 4.1, will equal full overhead, Column 4.4.

Record of Production, Betterment, and Repair Orders

This sheet (Form 78) is in reality much more than a record sheet; it is a ledger sheet which, while debiting and crediting labor, material, and overhead, at the same time makes possible an analysis of the distribution of all production, betterment, and repair orders, to labor, material, and expense. Furthermore, it closes out all order costs into unit costs, and gives absolute control of all inventory valuations as regards production, betterment, and repair orders (Forms 40-42).

It was in the development of this "Production Ledger," or "Record of Production, Betterment, and Repair Orders," that the real unification between cost and general accounting took place, as it was absolutely the finding of the missing link.

This is called a "Record for Production, Betterment, and Repair Orders" principally as a matter of convenience. It is recommended, however, that when a plant is sufficiently large a set of sheets be provided for production orders,

another set for betterment orders, and another for repair orders. Under any circumstances, a separate set should be kept for repair orders which are closed out into Column 11, after which follow the account and number of the account to which they will go, as per the classification of assets. What this classification of assets is has been explained fully in Chapter IV, under "Stores-Keeping."

There are two things to be considered in connection with this distribution sheet:

First, that this classification of assets permits betterments to be distributed under the column of account and number of account on this recording sheet.

Second, that all repair orders must be made according to the same classification as betterment accounts.

In other words, the value of all assets remains under assets at their original cost. From this inventory value, a certain depreciation is written off into liabilities each month in order to stabilize the cost of production. This percentage of depreciation is sufficiently large to cover not only natural depreciation, but also repairs that may be applied to recover depreciation. Therefore, all repair orders should be made out according to the inventory classification of assets, and not to the individual tool, except in cases of very large, expensive, and complicated machinery, such as printing presses. In such cases it becomes necessary to keep track of repairs on an individual machine so that obsolescence may be decided upon before the cost of repairs becomes greater than the interest on investment plus depreciation on a new machine.

Each production order at the end of a month will occupy but one line on this sheet, columns being provided to show the order number, sales order number, quantity ordered, and, when finished, the actual quantity made. Further

columns provide for the symbol or description of the item covered by the production order, and other columns show the "Date Started" and the "Date Finished." Under "Material" a column is shown for "General Stores" and for "Semi-Finished Stores," either column being used according to whether it is a processing order or an assembling order. A column is provided for all the labor applied to any production order, and three columns for overheads, one to show "Productive Hours," one the "Overhead Rate" on either an hourly or percentage basis, and one the total "Overhead Amount" applied to production orders.

Thus is shown the application of labor, material, and expense to orders, the total of which, of course, is the total cost. This total cost divided by the quantity made would give the cost of each. Therefore, for any and all purposes, cost has been closed up on this sheet and it is only necessary to transfer the goods at this cost price to the running inventory or other record in which such goods should appear.

Column 7 of the record of production, betterment, and repair orders shows the total of the unfinished production orders at the end of the month, which are transferred to Column 1 of the record for the following month. Then any additional material, labor, and expense required to complete the production order will be added.

Whenever an order is closed out into Column 6, it creates a credit to labor, material, and expense, according to the amount shown, and becomes chargeable either to Column 8, "Semi-Finished" or "Component Stores," to Column 9, "Finished Stores," or, if a betterment, to Column 10, "Betterments," in which case the asset account number to which it is to be distributed will be shown in the column headed "Account." What has been said of betterments will also apply to Column 11, "Repairs."

In the discussion of "Controlling Accounts" (Chapters

XIV and XV), it will be shown how the totals of these several columns are taken directly into controlling accounts as debits or credits, as the case may be.

This "Record of Production, Betterment, and Repair Orders" offers the same possibilities for accounting machine distribution work as departmental distribution sheet does. Thus, any requisition bearing an order number plus 2 would distribute a credit to general stores. Any order number plus 3 would distribute a credit to all requisitions on component stores. In the handling of labor, a labor ticket with the order number plus 4 would distribute all labor to order numbers and at the same time build up a total of productive labor. Again, if on each productive labor ticket there is also put the amount of overhead on whatever percentage or hourly basis it calls for, 5 can be added to the order number of that ticket, which will distribute all the overhead to Column 5 and to all production or betterment orders accordingly.

When this distribution has been filled in on the sheet, it then becomes simply a question of using a comptometer or adding machine to obtain credits to Column 6, and charges to Columns 7, 8, 9, 10, and 11.

In other words, as before stated, the whole arrangement of this distribution system is purposed, so far as possible, for handling by office machinery instead of ordinary clerical work, which not only insures much greater economy, but also a much greater accuracy, and at the same time gives a much wider range for temporary or specific statistical systems. Furthermore, it enables costs to be compiled on a cost card as shown below.

Production Cost Card

One of these cards (Form 79) can be made out for each piece and part manufactured and filed in order of piece and

part number. A summary of the total costs of labor, materials, and overhead on four production orders is provided for on each card, thus furnishing a comparison of the resulting costs of the various production orders as they come through. When a card has been filled up by the completion of four production orders, another card should be made out for succeeding orders and filed directly behind the first one, numbering the cards in rotation under each piece number; thus, piece No. 1000 might have cards 1, 2, 3, and 4, etc., as they become filled up; and so on for each piece, numbering from 1 up under each piece number.

When a production order is completed, the distribution department should enter the summary of the costs on this card. On the front of the card at the top will be given the grand total of the cost summaries, and below will be given the details. At the top of the card will be shown the production order number, the date started and date finished, labor and material costs, and overhead, making the total cost; and then the unit cost, or cost of one, will be shown. Following this will be the total cost of labor by operation, this information being furnished by the timekeeper to the distribution department.

On the line showing each operation has been provided a small letter "D". If this operation was done by day-work, this letter will remain, but if it is done as piece-work, the "D" will be made into a "P" in black ink; and if done as premium work, the "D" will be made into a "P" in red ink. On the line of each operation will then be given the date the operation was completed, the quantity passing the operation as good, the quantity rejected for scrap, the quantity rejected for repairs, the total productive hours, and the total labor cost for the operation. On the reverse side of the card, on the last line for labor, will also be shown the same information for any labor expended on defective

repairs. At the bottom of the reverse side will then be shown the quantity of each kind of material drawn and the total cost of each kind.

As these cards show the exact cost of production of various pieces, they should be available only to such executives as it is desired to have fully informed concerning costs, and to the particular employees whose duty it is to keep them.

If the distributing or accounting machines are not employed (smaller concerns are perhaps not justified in using such machines), the following method of procedure for distribution work in connection with time tickets, requisitions, etc., is recommended for consideration.

An organization chart (Form 76) and a distribution sheet as per the factory overhead (Form 77) having been made up, it simply remains to make a set of pigeonholes to correspond to each combination number, that is, the pigeonholes will be numbered by departments down the side and by activities and commodities across the top; this combination, of course, always forming a charge account. As the time tickets and requisitions come in from day to day, they are to be sorted into these pigeonholes, which sorts them to exactly the classification shown on the factory overhead distribution sheet. At the end of the month, the proposition is one simply for an adding machine.

First, the tickets can be totaled by departments and by account numbers as per the overhead sheet, which will give a complete departmental distribution of non-productive labor, material, and direct labor. Second, the tickets and requisitions may then be totaled on an adding machine according to order numbers. These can then be posted direct to the "Record of Production, Betterment, and Repair Orders" (Form 78), which method of procedure for both departmental distributions and for order number distri-

butions is simple and accurate, and does away with a great deal of clerical work in posting.

In Chapter XI, "Employment and Handling of Labor," a complete method of distribution was shown, which is preferable, the whole proposition in such case practically being an adding and calculating machine operation.

Whether a set of pigeonholes is used or whether accounting and distributing machines are used, depends somewhat on the nature of the business, volume of work, and the amount of detail that is required.

Sales Analysis Sheet

A tentative "Sales Analysis Sheet" is shown in Form 80, which illustrates how a monthly distribution of sales and costs can be arrived at by simply posting each day the total sales and the total cost to this sheet, using an adding machine at the end of the month to get the totals of all sales, which are then transferred to the monthly balance sheets. The method of procedure is to take the sales directly off the shipping orders each day together with costs, total them on an adding machine, and transfer them to this sheet; the method of handling sales and shipping orders nearly always being peculiar to each different kind of business.

This analysis sheet, which is referred to in several instances in Chapters XIV, XV, "Controlling Accounts," is presented here in order to make the working of the accounts involved perfectly clear.

CHAPTER XIII

COMMERCIAL OR OFFICE ACCOUNTING

Explaining in detail the elements and workings of a voucher system for handling cash; the detail of controlling accounts; and a commercial distribution of expense.

CHAPTER XIII

COMMERCIAL OR OFFICE ACCOUNTING

The Function of Commercial Accounting

The discussion which follows is not intended to be an explanation of bookkeeping in the ordinary sense of the word, but rather of commercial accounting which is the preparation for a distribution of summarized current receipts and disbursements to certain controlling accounts.

Further, it shows how and why these distributions in industrial enterprises are made by cost rather than by ordinary bookkeeping methods, and how this cost accounting is then linked with controlling accounts through the medium of commercial accounting.

The Voucher System

The best, and in fact the only scientific way of handling general accounting work, is by the voucher system, in which vouchers are used for entering all invoices, thus eliminating the old-fashioned purchase ledgers and the distributions contained therein. The voucher system herewith proposed consists of a purchase voucher (Form 81), which, in connection with a "Voucher Record" (Form 84), constitutes a purchase creditor's ledger, or a statement of the account with each purchase creditor. The voucher record, as its name implies, is a record of all these accounts and at the same time a distribution of all purchases to summarized or prime accounts, as will be explained further on.

These vouchers are entered on the voucher record, which

is closed monthly irrespective of whether any of the vouchers may or may not have been paid. This is an important fact to remember. The total amount of each column of the voucher record shown is then carried over to the private ledger or controlling accounts.

There is one thing in connection with the use of this form of voucher record to which attention is called, and concerning which reference has been made elsewhere; namely, that the expenditures of any manufacturing business always reduce themselves to three primary elements, i.e., labor, material, and expense. This is one of the cardinal principles of modern accounting, and advantage is taken of this to simplify controlling accounts.

General Stores Under the Voucher System

In order that this may be thoroughly understood, it is necessary to refer to general stores again, and to review enough of the previous discussion to connect them with the vouchering of materials. It will be recalled that general stores, from an inventory point of view, embraces everything that is purchased in the shape of materials, tools, equipments, etc. General stores may be issued to the factory only upon a requisition which must always show two things: first, the department which draws the material from stores, and, second, the order number to which the material is to be charged. If material is to be used for goods which are to be manufactured for sale, it must be charged to a production order. If for construction work or the installation of new machinery, it must be charged to plant betterments.

For instance, if a new machine of some kind is purchased, it will be received into general stores, the same as anything else that is bought, and on the voucher record the amount will simply appear as a charge to "General Stores." When

it is desired to install this machine, a betterment order is issued which authorizes a requisition drawing this machine out of general stores. To this betterment order will be charged any additional material which is required, the labor costs of installing the machine, and also some proportionate amount for overhead expense. Upon the completion of the installation, the betterment order is closed up and the total cost handed to the accounting department, there to be posted to whatever classification of assets it may belong.

Similarly, if any construction work on the buildings, or any other work that would create a fixed asset, is to be done, a betterment order must be issued. In this way the accurate cost of all betterments is secured and placed in the proper asset account.

The same thing applies to repairs, and the repair order must always show two things: first, the department of the factory for which the repairs have been made, and, second, the classification of assets that they are made on, so that the distribution of repair orders is made in the same manner as betterment orders.

From this explanation it will readily be understood why the old time voucher record distribution has given way before modern accounting methods, and why no distribution work is done on the present voucher record or in the controlling accounts other than that given under primary captions. Distributions are no longer a part of ordinary bookkeeping; they belong to the cost system and are recapitulated into controlling accounts.

Purchase Voucher

The purchase voucher (Form 81) is printed on sheets 5 × 8 inches and consists of an original and a duplicate. When an invoice, properly passed and O K'd for receipt, quantity, price, etc., is received by the accounting depart-

ment, the extensions are first proved and then entered on the purchase voucher. The purchase voucher must show the name and the address of the purchase creditor, date of invoice and amount. The invoice is entered on the voucher as soon as it is received, the number of the voucher is placed on the invoice, and the two forms are fastened together, and are then filed in a temporary file, in alphabetical order, until the voucher is entered in the voucher record. At the end of the month, the voucher is closed and entered upon the voucher record for distribution thereon, into the proper account or accounts.

Where it is desired to discount or pay an invoice before the end of the month, such invoice is entered on the voucher which is thereupon closed out as complete, is O K'd by the necessary authority, and the total posted into the voucher record. In entering the amounts of these vouchers on the voucher record in the accounts payable column, the gross amount of the voucher is entered, that is, no discounts are to be deducted at this time, provision being made for discount earnings in the check register in the column "Discounts on Purchases."

After vouchers have been closed out at the end of the month and entered in the voucher record, they should be filed in an "Unpaid Voucher File" until paid.

In order to provide for the payment of vouchers at the proper time, a monthly "one to thirty-one" card tickler (Form 82) should be kept, and the name of the purchase creditor together with the numbers of the vouchers which are to be paid on any particular date should be entered on the tickler card of that date. Several entries can be made on one card. On the date of payment, the vouchers are given to the cashier who passes them for payment and has the necessary checks drawn. Each check must show the number of the voucher paid, and its acceptance in payment

of the voucher thus indicated will make it a complete legal receipt for the same. The duplicate voucher accompanies the check as a remittance slip, and the original is filed alphabetically in the paid voucher file. After a voucher has been paid, all of the invoices covered by it are marked "Paid" and filed alphabetically.

By making all payments by check in connection with a voucher system as outlined above, a complete and proper distribution of the payments is obtained, and, as the voucher is not attached to the check and does not pass through the bank but goes direct to the payee, it does not reveal, as does the ordinary voucher check, what bills are being paid, dates, etc., for the information of everyone through whose hands the check passes.

Charge Vouchers

In order to provide for adjustments on purchase vouchers after they have been closed, charge vouchers (Form 83) are used. In order that the two types of vouchers may be easily distinguished, it is suggested that the charge voucher be printed in red, as indicated on form.

Charge vouchers should be numbered from 1 up, the same as the purchase vouchers, and the back page of the voucher record should be used to record all charge vouchers, where they should be entered in the same manner as the purchase vouchers. In paying a purchase voucher on which a charge voucher is deducted from the full amount, the number of the check should be placed in the proper column on the charge voucher record in the same manner as on the purchase voucher record. In the check record (Form 86) will be shown in the "Accounts Payable" column the full amount of the purchase voucher, and on the following line, in red ink, the amount of the charge voucher which, being deducted, leaves the amount of the check (except for cash

discount). This amount is entered in the "Net Cash" column.

In case a claim is made after a purchase voucher has been paid, and there are no other purchase vouchers from the same concern awaiting payment, a charge voucher will be used to adjust the claim, an invoice being sent to the purchase creditor to notify him of this claim. If this invoice be paid in cash, the amount should be entered on the incoming cash sheet (Form 85), and extended in the sundry column; the date of payment and "Cash Received" folio will then be posted to the charge voucher record and to the credit of the "Accounts Payable" column. "Deductions" column on the purchase voucher should be used whenever possible, to keep the number of charge vouchers within the smallest possible limits. Charge vouchers should be approved by some authorized person, and filed directly behind the purchase vouchers from which they are to be deducted.

Voucher Record

The voucher record (Form 84) provides for the date of the voucher, the voucher number, and the name of the creditor. These particulars must be entered in the voucher record when making the first entry. The extensions into the money columns on the voucher record should not be made until the voucher is closed out, usually at the end of the month. When closed, the total amount of the voucher is entered in the "Accounts Payable" column and the total of this column credited to this account in the private ledger. Voucher record sheets should be numbered consecutively and each sheet accounted for.

At the end of the month, as soon as the total amount of any voucher is entered in the "Accounts Payable" column, it is extended in the distribution columns to the accounts to which it should be charged. As all bills received by the

company are either for material or expense, and as all material (with the possible exception of office supplies) is charged to "General Stores," the distribution columns provided in the form are sufficient. These, as will be seen by the captions, correspond to the controlling accounts, to which the total under each caption must be charged monthly in the private ledger.

All material bought, with the exceptions noted above, is charged direct to "General Stores," and expense divided between "General Expense" and "Advanced Expense." "General Expense" will be divided into "Commercial" and "Overhead." Commercial expense is that which applies to the commercial or office end of the business, and the items from this column will be charged to the various subsidiary accounts, as will be explained under "Commercial Expense Distribution Sheet" (page 258). To the "Overhead" column will be posted all items of expense which are applicable to the manufacturing end of the business, for distribution to subsidiary accounts, as explained in Chapter XII, under "Factory Overhead Sheet for Distributions." In the "Advanced Expense" column will be charged all expenses the full benefit of which does not accrue during the current month, but which are prorated into actual expense charges for the period of time to which they properly belong. In the sundry column will be entered the distribution of any items on a voucher which cannot be charged to any of the previous accounts.

It is not necessary to post each individual check immediately it is made out in payment of a voucher, as the check record (Form 86) shows the voucher number covered by the check. It is advisable, however, to post the check record into the voucher record daily, entering in the voucher record the "Date Paid," the "Check Record Folio," and the "Check Number."

Incoming Cash Sheet

This sheet (Form 85) is designed for a record of cash received by the company, and *all* cash received should be entered thereon. It takes the place of the debit side of what would otherwise be the ordinary cash book which, in this system of accounting, is not used. For purposes of auditing, these cash received sheets are numbered consecutively when printed, and every sheet is to be accounted for, whether it is used or not. In case of error in making an entry, it should not be erased but a red line should be drawn through the entry. The purpose of the various columns are explained below.

Net Cash. Each day the exact amount of cash received from whatever source must be entered in the "Net Cash" column and deposited in the bank; the total of these items, at the end of each month, is charged to the controlling account A–1, "Cash in Banks" (see Form 92), in the private ledger.

Discount on Sales. In this column are entered all cash discounts taken by and allowed to customers. If, for any reason, a discount is taken but is not allowed, the check should be *returned* to the customer for correction and no entry made. At the end of the month, the total of this column is charged to the subsidiary commercial or office expense account, "Discounts Allowed."

Freight and Express—Commercial. In this column will be entered all freight charges which have been deducted by customers and allowed. In case freight deduction is not allowed, the remittance should be returned and no entry made. The total of this column at the end of the month is charged to the subsidiary commercial or office expense account, "Freight and Express—Commercial."

Sundry. The "Sundry" column is for any other charge items not specifically provided for on this sheet, such as

interest paid, special deductions allowed to customers, etc.

All advanced expense interest should be prorated monthly, the same as other advanced expenses, and distributed on an advanced expense prorating sheet, over the months covered.

Accounts Receivable. In this column is entered the total amount which should be credited to customers; therefore, each amount in this column must include not only the net cash received, but all discounts and deductions taken by customers and allowed, as specified in the foregoing columns. The total of this column at the end of the month is credited to the controlling account A–3, "Accounts Receivable," in the private ledger.

Notes Receivable. In this column is entered the face value of any notes receivable paid, but not interest received on these notes. The total of this column is credited monthly to controlling account A–7, "Notes Receivable," in the private ledger.

It is a much better plan to handle notes receivable on the income cash sheet than by journal entry or by posting direct from the notes book, if one is kept. In this way, the face of the note, if discounted, is entered in the "Notes Receivable" column on the credit side of the incoming cash sheet, and the amount of discount in the "Advanced Expense" column on the debit side. This also applies to customers' notes discounted by the company, which are entered to the credit of "Notes Receivable" on the incoming cash sheet, and the interest charged in "Sundry" column to "Advanced Expense Interest."

Notes Payable. In this column are entered the face amounts of any of the company's notes which are discounted, the discount being charged to Advanced Expense and prorated over the period covered. The total of this column

at the end of the month is credited to the controlling account D–3, "Notes Payable," in the private ledger.

Interest Received. In this column will be entered all interest received. At the end of the month, the total of this column is carried to the subsidiary commercial or office expense credit account, "Interest Received."

Sundry Accounts. This column should contain the name and amount of any item for which a check may have been received and which would not come under any of the previous captions. In the monthly posting of this column to the controlling accounts of the private ledger, it must be analyzed, hence the necessity of enumerating the items by name.

Folio. In the folio column can be written the initial of the bank in which each check is deposited, and, if desired, the date of deposit, the total checks to one bank each day checking with the amount of deposit on the check record. The incoming cash sheets should be proved at the bottom of each page to see that the charge side balances with the credit.

Check Record

The check record (Form 86) is used for recording all checks drawn, it being understood that all cash disbursements are provided for by a petty cash system. In connection with this check record, checks must be used in pads, each check being numbered consecutively. If a check is spoiled or is not used after being made out, the space for this check in the check record must be marked "Void," as every check must be accounted for.

The voucher number is entered in the check record, following the check number. No detail distribution, such as labor, material, various kinds of expenses, etc., is provided for in the check record, as is common in the ordinary

cash book, because the voucher record is used for all such distributions, and there must be a voucher for all disbursements. In this way distributions are all made at one place.

The columns of the check record are discussed below.

Net Cash. In this column are entered the exact amounts of the checks drawn, the total of which, at the end of the month, is carried to the credit of the controlling account A–1, "Cash in Bank" (see Form 92), in the private ledger.

Discount Purchases. In this column is entered the amount of any discount taken from purchases when paid, as called for on the voucher for which the check is drawn. The total of this column, at the end of the month, is carried to the commercial expense credit account, "Cash Discount Earned."

Accounts Payable. In this column is entered the total amount which is to be charged to the voucher record, that is, it covers the cash paid and also the discounts taken. The total of this column at the end of the month is charged to the controlling account D–1, "Accounts Payable," in the private ledger.

Notes Payable. In this column are entered the amounts of all notes paid by the company. At the end of the month the total is charged to the controlling account D–3, "Notes Payable," in the private ledger.

Sundry Accounts. The "Sundry Accounts" column provides a place for entering the name and amount of any item for which a check may have been drawn, and which would not come under any of the previous captions. A monthly posting is made of this column to the controlling accounts. It must be analyzed according to the items enumerated, hence the necessity of entering the details in this column.

Deposits. In the deposit column will be entered the amount of each bank deposit. The total amount of this

column, or columns in case more than one check record is kept, should agree with the "Net Cash" column on the cash received sheet.

Balance. The daily balances of "Cash in Bank" should be shown in this column. A separate check record must be kept for each bank in which an account is carried, and a distinct series of numbers used for each check record sheet, as well as for checks.

When checks are drawn upon one bank for the purpose of transferring money to another bank, the amounts should be entered in the sundry column of the check record sheet of the bank from which the amount is withdrawn. They should also be entered on the incoming cash sheet, and in the "Deposits" column of the check record sheet of the bank to which the amount is transferred. At the end of each month, cash received and cash paid out will be recapitulated upon the final cash received sheets for the month, and postings made from this recapitulation to the private ledger accounts.

Petty Cash Record and Voucher

For the handling of petty cash, what is commonly known as the "Imprest System" is recommended. In order to carry this out, the cashier must be provided with some fixed fund, anywhere from $200 to $500, or with an amount sufficient to cover expenditures of this character for, say, one month. This should be considered as a cash drawer fund, to be accounted for at all times, either by cash on hand, petty cash vouchers not yet turned in for refund, or both.

The amount of this fixed fund appears as a standing charge in Petty Cash account (A–2) in the private ledger, and it can be affected only by an increase or decrease in the original amount of petty cash. The checks issued to reimburse petty cash fund for its expenditures are not

charged to the controlling account "Petty Cash," but are simply entered in the "Receipts" column in the petty cash book or petty cash disbursements sheet (Form 88). The balancing charges for the outgoing cash are made monthly from the petty cash book, as explained later.

In order to secure a complete record of all petty cash expenditures, a petty cash voucher has been provided, to be used in conjunction with the petty cash record. (See Forms 87, 88.) These vouchers are to be numbered consecutively and each one must be accounted for. In case of an error in making them out, they should not be destroyed, but marked "Void," and *filed with the paid vouchers.*

One of these petty cash vouchers should be made out for each item of cash expended, and must always be signed by the person to whom the money is paid. It will then be entered in the petty cash book, under the distribution account number to which it is to be charged. If the voucher is in payment of an invoice, the invoice will be indorsed with the date paid and the petty cash voucher number. This invoice should be approved by the proper authority before being paid. The voucher, together with the invoice, will then be placed in the cash drawer in place of the cash paid out.

Each night, the cash in the drawer must be counted and the sum of this, plus the vouchers in the drawer, must agree with the standing amount charged to petty cash.

When the cash in the drawer becomes low, or at stated periods, say once a month or once a week as may be found the more advantageous, a check is drawn to the order of petty cash in payment of "Petty Cash Vouchers, No..... to No....." for the exact amount of these vouchers. This check will be cashed and the money placed in the drawer, bringing the funds back again to the original amount. A check drawn to reimburse this fund will be entered in the

check record in the sundry column, and will be a non-posting item, the postings being the monthly totals of the distribution columns in the petty cash book, which are posted to the controlling or subsidiary accounts, as the case may be. The redeemed vouchers must, of course, have first been extended in the petty cash book, as explained above.

It must, of course, be remembered that on the last day of each month, all petty cash vouchers which have been extended in the petty cash book must be reimbursed by check. If this is not done, the distribution of these on the petty cash book will throw the books out of balance.

It will also be understood that all cash received must be deposited in the bank and *never* be diverted into petty cash. In case stamps are received from customers in the settlement of their accounts, the petty cash drawer should purchase these stamps and the cash so received for them be deposited.

The advantages derived from the use of the petty cash vouchers and records are:

1. A voucher is secured for every petty expenditure.
2. The work of balancing the petty cash is minimized, as there is always a definite amount against which it is to balance.
3. The system provides a means for correctly making a distribution of all petty cash expended and the absorption of these expenditures into the proper general accounts.

Journal Register

Modern accounting has almost done away with the once much used general journal, by dividing it up into books of special functions wherever the volume of similar items has sufficiently increased to make it possible. All of the

foregoing forms are examples of this practice. There is, however, some necessity for journalizing in a general way, and in connection with the foregoing it is recommended that a journal register be used, somewhat similar to that shown in Form 89.

It will be noted that columns have been provided for the more frequently used accounts, i.e., accounts receivable, accounts payable, notes receivable, notes payable, and a sundry column, for any miscellaneous entries. In this manner the monthly totals can be posted instead of each individual item.

Journal Voucher

In connection with the journal register, a journal voucher (Form 90) has been provided for making journal entries of all kinds, thus affording a means for properly authorizing these entries. These journal vouchers must be numbered in sequence and filed in a binder provided for them and every number must be accounted for. If, for any reason, one is spoiled by accident or otherwise, it must be marked "Void" and filed in the binder in its place of sequence.

General Ledger

A general ledger should be provided, in loose-leaf form, to be used as a subsidiary book to the private ledger. This ledger should not be filled with the miscellaneous accounts so frequently put into a general ledger, but should, on the contrary, contain little else besides the accounts included in the analysis of commercial or office expenses (see page 258), and those included in the analysis of factory overhead (see under Chapter XII), all of which are a part of the monthly balance sheet sets.

The accounts in the general ledger should be opened in

the order given on the monthly balance sheet so that in taking off the balances at the end of the month they will conform to the same order of arrangement.

All of the accounts under analysis of commercial or office expense must be closed out each month into Commercial Expense account, J–1 (see Form 92). The total of each amount in the analysis of factory overhead must be closed out each month into Overhead account, J–2. These accounts do not need to be journalized by individual items; they are to be simply balanced out each month into Commercial Expense and to Overhead. In other words, these accounts are simply the totals of the columns on the distribution sheets, and cover in total the items entered in detail in the corresponding columns.

Commercial Expense Distribution Sheet

The detail of his analysis, by captions, is also illustrated on the set of balance sheets in Form 1, the latter showing the divisions as between "General Commercial Expense" and "Selling Expense." The commercial expense distribution sheet is in reality a general ledger sheet and contains the general ledger entries for an analysis of commercial expense which is to be carried in total monthly to Profit and Loss.

Comparison is made in the summaries of these accounts to show: first, the percentage of commercial expense as a whole to sales, and, second, the percentage of selling expense as such to sales.

Attention is again called here to the value of these percentages as a guide in conducting a business. If balance sheets similar to those illustrated in this work have been used for a period of some months or years, a number of definite percentage values will have been discovered. For instance, if it is known that the commercial percentage

averages 12% a month, this indicates what the normal condition of business should be, and the accounting methods herein illustrated make possible an analysis to determine the cause for any variations of this percentage.

What has been said of commercial percentages also applies to selling expense. If it is known that the average selling expense is 8% of the total sales, it is only natural to look for a variation from this as a first point of interest each month, and then to determine the cause for any such variation.

The same conditions apply to overheads. If overheads are running at an average of 80% and variation takes place, these accounting methods provide an analytical means for determining the cause therefor. With the assurances that these percentages are reasonably correct, any executive may always start a detail examination of his monthly balance sheets with a comfortable feeling.

General Commercial Expense

It will be noted that each column on the commercial expense sheet (Form 91) is numbered with its account number. The following is a brief description of the charges which are made to each account:

Salaries—Officers. This account should include the salaries of the general officers of the company, and all other officers, such as works manager or superintendent, office superintendent, purchasing agent, comptroller, industrial secretary, publicity agent, etc.

Salaries—Clerical. This account should include all the clerical labor of the office, including stenographers and typewriters.

Labor—General. This account will include all labor in the office which cannot be classified as clerks or officers, such as messenger boys, janitors, watchmen, etc.

Telegraph and Telephone. This account must be made to cover all telegraph and telephone expense chargeable to the office end of the business, but should not include any items which are chargeable to the engineering or manufacturing departments.

Office Supplies. This account includes all supplies, such as stationery, printed forms, books, pencils, etc., required for use in the general office.

Taxes—Corporation. This account will include all corporation taxes and whatever proportion of other taxes might properly belong to the general office, but should not include taxes on the factory buildings or personal property, such as stock on hand. The general office taxes will appear on the sheet as a monthly prorated account.

Legal Expenses. This account covers everything in connection with legal work as differentiated from patent work; that is, it is to cover all suits, litigations, collections, etc., not in any way connected with patents.

Patent Expenses. This account relates to everything in connection with the obtaining and the defense of patents. It covers not only the patent fees to the government, but also patent attorneys' fees, as well as the cost of all litigation of any character whatsoever in connection with patents.

Royalties. To this account will be charged any and all royalties paid for a product and sold by virtue of such payment. They are treated as commercial expense for the reason that, while they may theoretically constitute an additional cost to an article, they have nothing to do with manufacturing operations, either as labor, material, or expense. In other words, royalties are never paid for the privilege of manufacturing something, but for the privilege of selling something on which a profit may be realized, and for this reason they rightfully belong to selling expense.

Freight and Express—Commercial. To this account

should be charged freight and express chargeable to the commercial or office end of the business. This should include freight, express, and parcel post charges on goods delivered to customers, as the delivery of goods is a commercial transaction and should not be charged to the manufacturing end of the business.

Insurance on Stock. This should be charged to the commercial end of the business, inasmuch as it has nothing to do with manufacturing, simply being a warehousing item for the benefit of a sales or similar department.

Interest Paid. This account must be made to include interest paid on notes, etc., shown in sundry column on the voucher record, also as shown in the sundry column on the check record.

Discount Allowed. This account is intended to cover all cash discounts taken by customers in their remittances, as entered on incoming cash sheet, and will be the total of the "Discount Sales" column on that sheet.

Rent. This account is to cover any and all rentals paid for floor space for commercial or office purposes.

Commercial Reserves. This account consists of such depreciation items as apply to office furniture, fixtures, patents, bad debts, etc.

Expenses Unclassified. This account is meant to cover any and all small items not chargeable to any of the above accounts, but which belong to the general commercial end of the business.

Selling Expense

In all businesses it is well to divide commercial expense into two classifications, one covering general commercial expense, and the other selling expense which will include only such expense as is directly chargeable to the selling end of the business as indicated below.

Salaries—Salesmen. This account should include the total amount of salaries paid to salesmen, and must not be confused with salaries in connection with clerical or other work.

Labor—General. This account will cover any and all labor employed by the sales departments in and around the office, factory, warehouse, etc., which is directly under the control of the sales department.

Commission on Sales. To this account should be charged all payments to salesmen on commission for making sales of goods, as distinguished from those salesmen employed on salary. Where a salesman is employed on a salary and commission basis, the amount paid must be distributed accordingly.

Traveling. This account will show all expense incurred by traveling salesmen, including hotel bills, railroad fares, etc., and should be checked and audited from regular salesmen's expense account books, or forms of some kind.

Entertainment. This account is intended to include entertainment expense incurred for the purpose of making sales, sales contracts, etc., either by the company's officers or others.

Rebates and Allowances. To this account will be charged all rebates or other allowances made to customers as a matter of sales policy, but it should not include any rebates to customers for claims made by them which are chargeable to the manufacturing end of the business, such as claims for defective material, workmanship, etc.

Shows and Demonstrations. To this account should be charged any expense of shows or demonstrations for the purpose of selling goods, provided they are not in any way chargeable to regular routine business. This form of expense is generally covered by an appropriation of some kind and should be checked up accordingly.

Postage. This account covers postage on mail leaving the office relative to making sales, advertising matter, catalogues, etc.

Office Supplies. To this account should be charged all items covering general office material chargeable to the selling department, such as stationery, forms, pencils, books, etc., whether such items are used in the office or by men on the road.

Advertising. Advertising is divided into three classes: periodicals, circulars, and catalogues. For distribution purposes, a charge account should be created for each one of these items and the proper amount charged to each of them. In connection with circulars and catalogues, it should be borne in mind that, if say 100,000 catalogues are purchased which might last for a year or more, the expense for them should not all be charged up when they are received, but they should be brought into an inventory of general stores and prorated monthly for a period of one year at least, if not two. Many claim that catalogue valuations should extend for at least a year beyond the time of complete delivery to the public.

Selling Expense Unclassified. This is simply an account containing such small items as are not chargeable to other accounts.

Commercial or Office Expense Credits

As it is desirable to keep the actual expense separate each month from any credits obtained by the commercial or office end, it is advisable to keep all interest received and discounts earned entirely separate from interest paid and discounts allowed. This is done in order that executives may see the exact conditions in both respects; therefore, separate accounts should be provided in the general ledger for these credits, rather than combining them with the

debits under general heads. The following accounts should be provided for their entry:

Interest Received. This account represents the "Interest Received" column of the incoming cash sheet, and should, in addition to the usual interest credits, include all interest received by the company for any delinquent sales or contract accounts.

Cash Discount Earned. This account, representing the discount on purchases as shown on the check record, covers all discounts earned by the financial department due to discounting accounts payable.

Credits Unclassified. This account should be carried in the general ledger, to include any credit item not provided for above or by accounts opened subsequently.

Analysis of Overhead

The sum-total of all the accounts in this division in the general ledger will be posted to the general account J–2 in the private ledger, and will be obtained from the factory overhead distribution sheet discussed in Chapter XII.

Accounts Payable—Personal

Under this subdivision in the general ledger may appear whatever personal accounts it is absolutely necessary to carry, and they will go into the corresponding controlling accounts in the private ledger if it is found necessary to open such accounts.

Other accounts than those previously specified can be opened in the general ledger from time to time as necessity may require, but, as before said, the general ledger should not be crowded with miscellaneous accounts; all such items should be classified in the voucher record or the journal register, as otherwise the analysis of the monthly expenditures could not be accurately made.

CHAPTER XIV

CONTROLLING ACCOUNTS
NATURE; ASSET ACCOUNTS

Illustrating and explaining a chart of controlling accounts, and giving in detail the source from which the debits and credits of each asset account are obtained.

CHAPTER XIV

CONTROLLING ACCOUNTS
NATURE; ASSET ACCOUNTS

Purpose of Controlling Accounts

This and the next chapter set forth in detail the composition of all accounts for a private ledger, as per chart (Form 92). These accounts are commonly called "Controlling Accounts," meaning summary accounts that will give the debit or credit balance of the values with which they treat entirely independent of the corresponding subsidiary current accounts as carried in current ledgers.

For instance, account No. A–3, "Accounts Receivable" (see Form 92), is made up by taking from the sales analysis the total sales for the month, and from the incoming cash sheets the total amount of cash received on account from customers for the month, and the balance of the account constitutes the amount of outstanding accounts receivable. This figure having been obtained, the bookkeeper in charge of the customers ledger should draw off his balances for comparison. That is to say, he totals each customer's account, adds up the debit balances of all accounts, any credit balances being deducted, and the figure thus obtained *must* agree with the balance of the controlling account. If it does not, there is a mistake somewhere.

For further illustration, what has been said of "Accounts Receivable," also applies to "General Stores" (B–1). The total of all purchases as taken from the

voucher record, less the total of all materials which have been used or sold as taken from the monthly distribution and sales analysis sheets, represents the controlling account inventory of general stores. To prove this, the stores recorder may be asked to draw off the inventory values of balances on hand, as shown on the stores records. Theoretically, these figures must agree, so that here again there is absolute control of materials, as information is drawn from two independent sources.

In other words, the balance of any controlling account can be checked against a balance obtained from an entirely separate source, and in this way an absolute check or control of the accounts in question is maintained.

These private ledger or controlling accounts are arranged, as shown on the chart, in such a way that a thirty-day statement of the business in its entirety and, by certain details, can be easily obtained. Furthermore, this information is in statistical form, thus giving an opportunity to read between the lines of figures and make time period comparison of individual items as well as totals, as illustrated in Chapter II.

In addition, these controlling accounts *supply the unification required between cost accounting and general accounting.* This is so for the reason that many of these accounts are controlling accounts for cost work, particularly those pertaining to general stores, finished stores, work in progress, plant betterments, reserves, depreciations, etc.

Again, these controlling accounts give the same information monthly that older methods of accounting gave but once a year; consequently, the adjustments in prices necessary to keep the business profitable can be made twelve times as often as they could under the older methods. The value of this is incomparably greater than its cost.

It will be understood, of course, that the movement in a set of controlling accounts is a series of debits and credits, and that the charging of any one account with an item of any kind, means that some other account must at the same time have a credit given it, and this exchange of items by debits and credits is so woven together as to form a continuous and complete history of the activities, progress, and finances of the business.

Chart of Controlling Accounts

In order to show the classification required for controlling accounts, the chart given in Form 92 has been prepared. On this appear the headings and divisions, "Assets," "Liabilities," and "Profit and Loss," and under them the various controlling accounts required to distribute these primes into the detail necessary for intelligent administration. The chart shows by its arrangement how each account obtains its number. Each one of these accounts is described in this and the following chapter. The charges and credits given under any heading, such as "Accounts Receivable," "General Stores," or "Profit and Loss," always signify with what that particular account is to be charged or credited, indicating in each instance the other account involved, which is to be credited or debited as the case may be.

The general divisions for these accounts are indicated by letters, each general division then being subdivided by numbers. Also, as may be seen by the following illustration, this classification is identical with the order of arrangement on the monthly balance sheet described in Chapter II.*

*Some difference will be found in the titles of accounts used in the balance sheet of Chapter II and in the chart of controlling accounts discussed in this and the following chapter, this being due to the fact that the businesses from which these forms were respectively taken differ in some details, the two forms being presented exactly as they were used.

Assets	*Liabilities*
A. Current	D. Current
B. Inventory	E. Reserves
C. Investment	F. Capital, Bonds, and Mortgages

Profit and Loss

G. Revenues (by sales)
H. Costs (of sales)
J. Expenses
K. Profit and Loss (monthly and general)

The accounts in a private ledger should be opened in the order in which they appear upon the chart, so that a trial balance taken from the private ledger can be transferred to the monthly balance sheet and profit and loss statement with the least possible expenditure of time. Any other necessary accounts can be placed in their appropriate class on the chart. All entries into private ledger accounts *must* be made by journalizing, and all such entries should be *properly authorized* before they are made.

Classification of Asset Accounts

Primarily, assets always divide themselves into three captions, as illustrated:

A. Current, which relates almost exclusively to cash and accounts receivable.
B. Inventory, which relates almost exclusively to movable or convertible assets.
C. Investments, which relate exclusively to assets that are either permanent or are consumed in factory operations, such as real estate, machinery, dies, jigs, etc.

Classification of Liability Accounts

There are three classes of liabilities, namely: D, Current; E, Reserves; and F, Capital, Bonds, and Mortgages.

Current liabilities represent moneys payable in cash within a definite period of time, usually 10 to 90 days.

Reserve accounts are created to protect capital investments by crediting these accounts periodically with an amount from surplus or profits to provide for the wastage, shrinkage, or obsolescence of the assets to which they apply, and debiting them with the actual loss by repairs or replacements on such assets. In this way the asset accounts always show the original purchase or cost price, while the corresponding reserve account indicates the amount of depreciation or wastage.

Capital, as its name implies, is the amount invested in order that a business may be created and conducted, but as it is returnable to the investor under certain prescribed condition, it is always a liability.

Classification of Profit and Loss Accounts

Monthly Profit and Loss is the final account into which go the profits and losses resulting from all monthly transactions. Its balance is at once transferred to Profit and Loss General. Profit and Loss General account establishes the dividing line between accounting work and executive work. In other words, the Profit and Loss account is the final expression of what has been accomplished and this is as far as the accountant can go by routine methods. It now remains for the executive to say how and by what means the results shown by this account shall be disposed of, as per the surplus and dividend accounts.

To arrive at the above, three factors are to be considered: viz., revenues, costs, and expenses, as shown on the chart.

ASSETS—A. CURRENT

A–1. Cash in Bank

This account represents the total amount of cash on deposit in all banks. If an account is carried in more than one bank, a separate register should be used for each bank. All checks should be put up in pad form, and each one given a separate number. When a check is spoiled it should be marked "Void" and so indicated on the check register. Any check so marked must be turned in and filed in its proper serial place with other returned checks; otherwise an audit is always questionable.

Charge	*Credit*
From incoming cash sheets, with all cash received in monthly totals.	From check record, with all cash paid out in monthly totals.

Note: All cash received from any source whatsoever ***must be deposited.***

The balance of this account represents the total amount of cash on deposit at the banks, subject to reconciliation with the actual bank balances as shown by pass-books after providing for the outstanding checks and undeposited items. This balance should be proven at least once a month by the use of a "Bank Reconciliation Sheet."

A–2. Petty Cash

This account represents the amount of office cash with which to pay petty expenses.*

*See discussion of petty cash voucher and disbursements sheet in Chapter XIII.

Charge	*Credit*
From check record, on opening the account, with the definite amount determined upon to be carried as petty cash.	From incoming cash sheets, with the amount of cash received back from the petty cash fund to decrease the account.
From check record, with any amount drawn to increase permanently the account.	

Note: Checks to reimburse the cashier for these expenditures should never be charged to this account, as it always remains constant unless the fund is purposely increased or decreased.

The amount of cash in the cash drawer, together with any properly proven petty cash vouchers that have not yet been redeemed by the general cashier, must at all times be equal to the permanent balance of the Petty Cash account.

A–3. Accounts Receivable

This account is the controlling account of the customers ledgers. Postings are made at the end of each month in totals, as follows:

Charge	*Credit*
From sales analysis, with the total credit sales for the month.	From incoming cash sheets, with the total amount of the "Accounts Receivable" column.
From journal vouchers, with charges against customers, as shown by the monthly recapitulations.	From journal vouchers, with monthly total, as per recapitulation of notes receivable from customers, and all other items credited to customers' accounts not mentioned above.
From check record, with any amount paid to customers or for their accounts.	
From petty cash book with any amounts paid to customers or for their accounts.	

The balance of this account is the outstanding accounts receivable, and should be checked against the customers ledgers once a month.

A–4. Accounts Receivable—Past Due

This account is of great importance as a matter of information. If accounts are past due to any great extent, it shows either one or all of three things: that collections are not being properly cared for, that bad sales are being made, or that general financial troubles are affecting collections. In some lines of business, accounts past due become interest-bearing which is often an item of considerable importance.

Any concern can determine about what percentage of accounts is always legitimately past due and any variations from this percentage should be immediately looked into. The account is handled as follows:

Charge	*Credit*
From journal voucher, with any or all accounts which are actually past due.	From incoming cash sheets, with all amounts received and classified under accounts receivable past due, as shown by the analysis of the sundry column.

The balance of this account is the outstanding accounts receivable past due.

A–5. Accounts Receivable—Consigned

This account represents the amount of outstanding claims on goods which have been sent out on consignment. In other words, B–5, Finished Stores (Branches), would cover any and all goods sent out on consignment, while account A–5 represents the sales which have been made on these goods. This account is one that in many lines of busi-

ness must be watched very carefully as defalcation has probably been made more often through it than in any other phase of business. Accounts Receivable—Consigned should be carried as follows:

Charge	*Credit*
From journal voucher, with all sales of consigned goods.	From incoming cash sheets, with all amounts received in cash for accounts receivable (consigned) as shown by analysis of the sundry column.

The balance of this account is the outstanding accounts receivable on goods consigned, and the aggregate balance of the consignment customers ledger must agree with this balance and must be proven once a month.

A–6. Accounts Receivable—Suspense

This account should be carefully analyzed. Too often, unfortunately, it has been abused by carrying in it accounts that have long been dead and past any possible collection. This, of course, creates fictitious assets.

Accounts Receivable—Suspense should be charged, and Accounts Receivable credited, with all accounts doubtful enough to justify the transfer. But it must be borne in mind that, at the same time, the individual account in the customers ledger must be transferred to a subsidiary suspense account in that ledger, using a separate sheet for the same. Each suspense account should be put on one line, and all these items should appear together on one or two pages.

Accounts which are finally found uncollectible should be credited to this suspense account and charged to reserve for bad debts; therefore, the construction for a balance is as follows:

Charge	*Credit*
From journal voucher, with accounts which are not actually bad though of problematical value.	From journal voucher, with all accounts determined to be absolutely uncollectible. From incoming cash sheets, with all amounts received in cash for accounts receivable (suspense), as shown by analysis of the sundry column.

The balance of this account represents the actual amount in suspense and should be proven at least once a month.

A–7. Notes Receivable

In handling this account, it should always be borne in mind that if notes receivable are discounted, the full amount of the note must be entered in the "Notes Receivable" column on the incoming cash sheets and the discount on such notes in the "Sundry" column on the charge side (see Form 85). If notes receivable are held for payment, however, the amount of cash received in payment of the note must be credited in "Notes Receivable" column, and interest received on these notes credited in the "Interest Received" column on the incoming cash sheet. This account always represents the total amount of notes receivable and is constructed as follows:

Charge	*Credit*
From journal or notes receivable book, with all notes received from customers.	From incoming cash sheets, with all notes receivable paid during the month. From journal voucher, with the notes receivable not paid at maturity. The amount of such notes, plus interest accrued, is then charged to the persons from whom the notes were originally received.

The balance of this account should agree with the amount of notes on hand and should be proven once a month.

A–8. Advanced Expense—Insurance

This is only another name for what is commonly termed unexpired insurance. One account may cover all classes of insurance paid, or it may be divided into different accounts, as fire insurance, liability insurance, compensation insurance, foreign insurance, etc. It is shown here only as a total.

Advanced expense (insurance) is an expense which cannot be charged into any one month. In other words, if insurance is paid for twelve months in advance, it must be prorated over the twelve months for which it is paid. Insurance accounts could, of course, be charged into a general advanced expense account, covering many expenses that cannot be charged into any one month but must be prorated over a considerable period of time. Where this is done, all items should be carefully scheduled in an advanced expense prorating book, thus showing the monthly amount of each class.

Advanced Expense—Insurance account is carried as follows:

Charge	*Credit*
From voucher record with the total amount of money paid for insurance in advance.	From journal voucher, with the proportion of these expenses for each month, as per schedule of advanced expense prorating sheets.

The balance of this account shows the amount of insurance properly chargeable to subsequent periods by monthly proratings.

A–9. Advanced Expense—Advertising

There is probably no account under assets more debated and perhaps more debatable than this, for the reason that the time period value of advertising can never be anything but an estimate. Expenditures of this kind come usually in large payments in some particular month. For instance, invoices may be received and paid in some one month for $10,000 worth of catalogues; this does not, however, mean that the expenses for these catalogues should be charged up to that particular month. On the contrary, they may constitute a year's supply and should be prorated, by months, as with insurance. This principle can properly be applied, to certain forms of trade journal and periodical advertising, the cost of which should be spread over a certain period.

Advanced Expense—Advertising account is handled as follows:

Charge	*Credit*
From voucher record, with the total amount of money paid out for advertising of any kind, as per analysis of sundry column.	From journal voucher, with the monthly proportion of these expenses, as per schedule of advanced expense prorating sheets.

The balance of this account shows the amount of advanced expense (advertising) properly chargeable to subsequent periods by monthly proratings and should frequently be checked against the balance shown on the prorating sheets.

A–10. Advanced Expense—Salesmen

This account is practically of the same nature as account A–9, and represents an amount of money charged out which is as yet undistributed and which must come back

on vouchers for traveling expenses. When these vouchers come in, their amounts will be distributed to commercial expense, as shown under commercial expense analysis (Chapter XIII).

This account is to be handled as follows:

Charge	*Credit*
From voucher record, with the total amount chargeable to this account as per analysis of sundry column.	From journal voucher, with the monthly charge to expense or to the salary account of salesmen.

The balance of this account shows the amount of money advanced for expenses and still in the hands of salesmen.

A–11. Treasury Bonds

In connection with this account, it must be distinctly understood that treasury bonds are those that have once been issued but later taken back into the company's possession, either for cash or for liquidation of a debt, and that the term does not, in any way, designate unissued bonds. The account is to be handled as follows:

Charge	*Credit*
From journal voucher, with any bonds received in payment of goods or other indebtedness. From voucher record, with any money paid for bonds as per sundry column analysis.	From incoming cash sheets, with any cash received from the sale of treasury bonds.

The balance of this account represents the value of the treasury bonds on hand.

A–12. Treasury Stock—Preferred

As in the case of bonds, treasury stock is that which has

been issued and then taken back into the company's possession. The term does not, in any way, refer to unissued stock. The Treasury Stock—Preferred account is to be handled as follows:

Charge	*Credit*
From journal voucher, with any preferred stock received in payment of goods or indebtedness.	From incoming cash sheets, with any cash received for the sale of treasury preferred stock.
From voucher record, with any amount paid for preferred stock as per sundry column analysis.	

The balance of this account represents the value of preferred treasury stock remaining unsold.

A–13. Treasury Stock—Common

As already stated, treasury stock is that which has once been issued and then taken back into the company's possession, either as a donation, or for cash, or for liquidation of some debt. The account is to be handled in the same manner as A–12, "Treasury Stock—Preferred," discussed above.

The balance of this account represents the value of each treasury stock remaining unsold.

A–14. Labor

This account represents the total amount of any and all labor employed by the company and must include all wages and salaries. The total of this account is to be obtained from two different sources, as indicated below, and can at any time be checked against the time sheets, thus affording a method for making a monthly audit of all money paid out for labor.

Charge	*Credit*
From voucher record, sundry column, with monthly total of all labor paid for.	From record of production, betterment, and repair orders, with total of column 4 (Form 78).
From petty cash disbursements sheet, with monthly total of the labor column.	From factory overhead sheet, with total of labor column (Form 77).
	From commercial expense distribution sheet, with totals of columns 1, 2, 3, 17, and 18 (Form 91).

Note: The above method requires that a voucher be drawn for each pay-roll made up, thus showing the authorization and approval of the same.

All salaries paid by check should be handled in the same way, as full authorization for the payment of labor can be obtained in no other way.

If a company pays its employees two or four times a month, this account must naturally balance out; if, on the other hand, it pays *weekly*, an "Accounts Payable Pay-roll" must be opened under "Liabilities" in order to show a balance on unpaid labor at the end of the month.

Assets—B. Inventory

As stated in connection with stores-keeping, no matter what the nature of a purchase is, it must first pass into general stores and be issued from general stores to some order number by means of a requisition.

It is only by taking everything into general stores and by the use of a production, betterment, repair, or distribution order, to transfer the item to some other form of inventory, that valuations are maintained through all the uses to which materials, tools, etc., may be put.

B—1. General Stores

General stores is a controlling account for such items as go to general stores, the balance of which is obtained as follows:

Charge	*Credit*
On opening the account with the value of general stores, as shown on the general stores record.	From production, betterment, and repair order distribution sheet, with monthly total of column 2 (Form 78).
From voucher record, with monthly total of "General Stores" column.	From commercial expense distribution sheet, with monthly total of columns 5 and 25 (Form 91).
From production, betterment, and repair order record, with monthly total of items made for general stores, as per sundry column.	From factory overhead sheet, with monthly total of column 2 (Form 77).
	From sales analysis sheets, with total of general stores sold.

Note: An invoice or a sales slip must be obtained for each and every item of material purchased.

The balance of this account represents the inventory of general stores and must be made to agree with any physical inventory when it is taken, the difference, if any, being carried to the Profit and Loss account. The balance of this account can also be reconciled monthly with the inventory values of "Balances on Hand" as shown on the stores record kept by the stores recorder.

B—2. Work in Progress

It is a well-recognized fact that, to obtain a thirty days' statement in any business on a perpetual inventory basis, it is absolutely necessary to create a controlling account called "Work in Progress" which shall be the holding account for all work being done of a productive or asset

increasing nature. This has been described very fully in Chapter IV under "Stores-Keeping" and need not be discussed in detail here other than to say that, to cover this account completely is one of the principal functions of the record of production, betterment, and repair orders (Form 78). On this record are gathered all orders covering work relative to production and betterments for the month, and these orders are recapitulated under proper columns by production orders horizontally and by totals vertically.

The composition of the Work in Progress account should be as follows:

Charge	*Credit*
On opening the account, with the present value of production and betterment orders.	From production, betterment, and repair order sheet, with total of columns 8, 9, and 10, by items.
From production, betterment, and repair order sheet, with total of columns 2, 3, 4, and 5, by items (Form 78).	

Note: While the production, betterment, and repair order sheet is used for collecting repair orders, so as to classify them in totals for accounting purposes in connection with depreciation, it should be understood that repair work does not form a part of "Work in Progress." These orders are taken care of through "Depreciation" and ultimately become a part of the overhead. For this reason they should not be totalled into the "Work in Progress" account.

The balance of this account represents the inventory of work in progress, and should be shown in the total of column 7 on the production, betterment, and repair order sheet. It should be borne in mind that, in handling this sheet, all uncompleted production and betterment orders, closed into "Unfinished Work in Progress," column 7, are transferred to column 1 of the sheet for the next month.

These orders constitute the previous value of work in progress, hence overhead expense must be prorated to them, the same as though they were completed orders; otherwise a correct inventory could not be obtained and the overhead expense for the month could not be absorbed into inventories as it should be.

B–3. Component Stores

This account is a controlling account, as described in Chapter IV, under "Stores-Keeping," the debits and credits for which are as follows:

Charge	*Credit*
On opening the account, with the present value of component stores.	From monthly production, betterment, and repair order sheet, with the total disbursements of component stores to production orders, as shown under column 8.
From monthly record sheet of production and betterment orders, with all completed component stores as credited to monthly work in progress and shown under column 8 (Form 78).	

The balance of this account represents the book inventory of component stores.

B–4. Finished Stores

This is a controlling account of all such stores as are available for merchandising under whatever classification they may exist, by models, etc. It should be handled as follows:

Charge	*Credit*
On opening the account, with the inventory value of present finished stores.	From sales analysis sheet, with total sales of finished stores.
	From monthly distribution of

From production, betterment, and repair order sheet, with all finished stores completed as credited to "Work in Progress" and chargeable to "Finished Stores," as shown under column 9 (Form 78).
From sales analysis sheets, with all finished stores returned by customers and placed in stock.

production, betterment, and repair orders, with any finished stores used in production. (This seldom occurs, but when it does, the finished stores item must be placed in the same column as component stores and the entry made in red ink to distinguish it from component stores.)

The balance of this account represents the book inventory of finished stores.

B–5. Finished Stores (Branches)

There are very few concerns which have branch stores in which they carry stock. However, where this is done, the amount of finished stores on hand in branches is obtained by crediting finished stores at the factory and charging branches.

B–6. Shop Stores

This is a holding account to prevent any discrepancy in inventory valuations when taking a physical inventory. In other words, these are supplies issued from general stores and charged up to expense but held in sub-stores stations for the convenience of the factory. Unless a holding account of this kind is provided, on taking a physical inventory, a considerable sum that had already been charged up to expense, might be recorded, whereas by keeping this account for shop stores at some fixed sum, subject to adjustment under Profit and Loss, such an error will be avoided, and at the same time opportunity will be given to find to what extent these stores are being used. Therefore, an adjustment from shop stores bin cards (used simply to show "Received," "Given out," and "Balance")

should be made on this account at least once every three months.

The account will be opened as a stores account, and debited with the value as shown by the quantity on the bin cards of shop stores. This account will be increased or decreased by an adjustment in profit and loss from time to time.

The balance of this account represents a certain fixed investment in stores that have been issued but not used.

Assets—C. Investments

Attention is called to the fact that the following accounts have to do with money which is absolutely tied up in the business, that is, fixed investments, the nature of which is such that no "turnover" can be applied to them; whereas all of the preceding accounts under A and B deal with assets which are subject to contraction and expansion according to trade conditions. In other words, all of the assets under A and B are readily convertible and are so considered by banks and other financial institutions, while those under C are assets that are of a peculiar value to the individual business, but are not readily convertible, and are subject to a heavy shrinkage in case of a forced sale. Therefore, in order to protect money tied up in investments, there has to be established a reserve or depreciation fund which by some method of accounting must be worked into costs of production. To arrive at this, two ways are open:

1. A rent charge which shall become a part of the overhead expense and out of which depreciations on the buildings and real estate investments are taken care of; or

2. A method of depreciation, on a percentage basis, the amount of which shall be charged directly into overhead.

Generally speaking, the second plan is preferable. It is, however, to be borne in mind, that the original investments in buildings, building equipment, and machinery should never be lessened in the controlling accounts, as decreases are entirely taken care of by depreciation accounts. Real estate does not come under this rule, as appreciation might take place and is then entered directly on the controlling account, as shown under the next heading. Further, this method of procedure is quite necessary in connection with replacement and insurance values. In other words, the balance of this account should always be equal to the original inventory or purchase values, and be protected by a reserve for depreciation; otherwise invested capital would be consumed by dividends not earned.

Another point to which very careful consideration should be given, is that, whatever the total expense of the business may be, it must always come out of the profits; therefore, the cost system, or system of distribution must provide for the absorption of the expenses into its cost of production. Hence, in connection with all accounts under "Investment," wasting of invested capital must be protected by reserves which must be prorated into costs each month. In other words, depreciations on original fixed investments must be taken into account before legitimate profits are available in dividends to the stockholders of the company.

C–1. Real Estate

The treatment of this account under "Investment" is as follows:

Charge	*Credit*
On opening the account, with the present book or appraised value of all real estate. If appreciations on surrounding real estate have been very pronounced within a recent period, the company's property should be re-appraised and adjusted accordingly. This is very necessary when property is to be covered by a mortgage.	In case of any sale, the account is credited with the book value of the real estate sold, while the excess of selling price over book value is credited to Profit and Loss.
From check register, with the amount of any check in payment for real estate.	
From journal voucher, with all notes or mortgages given in payment for real estate.	

The balance of this account is the cost or appraised value, as the case may be, of real estate owned.

It is held by many authorities that an increase in land value should not be shown as such on the books. However, there would seem to be no good reason why land should not be treated in the same manner as any other commodity. In all of the other transactions of a business inventory valuations fluctuate according to given conditions. For instance, by using the last purchase price on materials, which is the exact replacement value of the material, we change the valuations up or down of all the materials on hand. The same applies to the price on finished parts; the last regular production order cost being used for all inventory and cost valuations made, thus increasing or decreasing the valuation of all such assets on hand. These things are all arrived at from practical experience in trying to operate a business on a reasonable

and efficient basis, conserving in all instances valuations on assets. As stated before, changes in land value, if based on bona fide appraisals, should be treated in an identical manner.

C–2. Buildings

In the case of buildings it is necessary to consider a fixed depreciation; therefore, the treatment of the Buildings account would be as follows:

Charge	*Credit*
On opening the account, with present book value of buildings. If there is any question about their value, they should be appraised by a committee or appraisal company.	From incoming cash sheet (Form 85), with any amount received in payment or buildings sold, as per analysis of sundry column.
From record of production and betterment orders, with the amount of any betterments to buildings. (This does not include repairs.)	From journal voucher, with the difference between the selling price and the original cost of any betterments to buildings when these are sold, this difference naturally representing a loss.

Note: Whenever contract work is done on buildings, either new or old, the cost should be charged to General Stores and then be drawn out on a betterment order and charged to Buildings account.

The balance of this account shows the original cost of buildings together with any subsequent increase in value from betterments. The current estimated value is the difference between the balance of this account and the balance of E–2, "Reserve for Buildings."

C–3. Building Equipment

This account should consist of such items as are in reality a part of the buildings, and are not used *directly*

for manufacturing or processing purposes, such as elevators, plumbing, steam fittings, electric light and power wiring, gas fittings, sprinkler system, etc. These are distinguished from the building proper, largely because they are subject to a much more rapid depreciation than is the building itself; for instance, it might not be necessary to write off more than 2% on the buildings, while on the items above mentioned, 5% to 10% per annum might be required.

The handling of Building Equipment account is as follows:

Charge	*Credit*
On opening the account, with the present book values of this equipment. If this value is not available, an appraisal should be made.	From incoming cash sheets, with any amount received in payment for building equipment sold.
From monthly betterment order record, with all completed plant betterments chargeable to building equipment. This must include all contract work which should be passed through stores and requisitioned out as betterment material, so that all betterments to building equipment will make themselves manifest on the monthly betterment order record.	From journal voucher, with the difference between selling price when sold and the original cost.

The balance of this account shows the original cost of building equipment, together with any subsequent increase from betterments; the current value being the difference between the balance of this account and the balance of E–3, "Reserve fon Building Equipment."

C–4. Office Furniture and Equipment

This account covers furniture of all kinds, and office equipment such as typewriters, adding machines, etc. As items of this nature must pass into general stores when purchased, no distribution of any kind will be charged to this account through the voucher record; therefore, these items will have to be requisitioned out and distributed against some betterment order number. The account must be handled as follows:

Charge	*Credit*
On opening the account, with the present book value of office furniture and equipment. If this is not available, they must be inventoried.	From incoming cash sheets, with all cash received in payment for office furniture and equipment sold, as per analysis of sundry column.
From monthly betterment order record, with all completed plant betterments chargeable to office furniture and equipment.	From journal voucher, with the difference between the selling price and the original cost of any office furniture and equipment plus any betterments when sold.

The balance of this account shows the original cost of office furniture and equipment together with any subsequent increase in value for betterments. The current estimated value at any time is the difference between the balance of this account and the balance of E–4, "Reserve for Office Furniture and Equipment."

C–5. Machinery and Tools

This account represents the value of all the machinery and shop equipment in the plant, except the power and lighting apparatus; it includes tools that belong to, and are parts of, a machine, but does not include dies, jigs, fixtures, and gages, or any items that go into miscellane-

ous equipment, as these are provided for in separate accounts. All items covered by this account must be purchased and passed into general stores and then drawn into the factory by a proper betterment order; therefore, no direct charges from the voucher record are permissible. This account will be handled as follows:

Charge	*Credit*
On opening the account, with the present book value of machinery and tools. If not available, then appraisal must be made.	From incoming cash sheets, with any amount received in payment for machinery sold as per analysis of sundry column.
From monthly betterment order record, with all completed plant betterments chargeable to machinery.	From journal voucher, with the difference between selling price and the original cost of any machinery or tools plus any betterments added thereto when sold.

The balance of this account is the original cost of machinery and tools together with subsequent increase in value from betterments. The current estimated value at any time is the difference between the balance of this account and the balance of E–5, "Reserve for Machinery and Tools."

Special Account—Power and Light Equipment

While no special account is shown on the chart or balance sheet, it is quite necessary sometimes to separate the investments in a power and light plant from the investment in the rest of the plant, inasmuch as it is a special service feature which may be utilized by more than one plant. In other words, it is a producing factor which, if properly handled, would have costs computed on an independent basis and its product sold to the parent plant, and

to others if it furnished service to them. Therefore, it may be desirable to have an account controlling the investment in all such items of power and light equipment, as engines, boilers, pumps, tanks, generators, air compressors, etc.

Like all other things, items of this nature must be purchased and put in general stores and not be distributed from any voucher record. It is suggested that this account always be handled in total and in the following manner:

Charge	*Credit*
On opening the account, with the present book value of power and light equipment. If not available, an appraisal must be made.	From incoming cash sheets, with any amount received in payment for power and light equipment sold.
From monthly betterment order record, with all completed betterments chargeable to power and light equipment.	From journal voucher, with the difference between the selling price and the original cost of power and light equipment plus any betterments when sold.

The balance of this account shows the original cost of power and light equipment together with any increase in value from betterments. The current estimated value at any time will be the difference between the balance of this account and the balance of "Reserve for Power and Light Equipment."

C—6. Dies, Jigs and Fixtures

Particular consideration should be given to this account, as it often represents values of a temporary nature. In other words, it represents an investment in many tools, which should not be written off to expense immediately upon their purchase, or completion, but which must be retired by what is known as a rapid depreciation fund

amounting to anywhere from 20% to 100% per annum. This sort of equipment must be sharply distinguished from small tools, such as drills, reamers, and cutting tools (excepting perhaps large milling cutters), which are bought and put into general stores and are immediately written into expense as soon as issued to the factory.

This account should be handled as follows:

Charge	*Credit*
On opening the account, with present book value of all dies, jigs, and fixtures in use.	From journal voucher, with the initial cost of these items when they become absolutely worthless or are discarded.
From monthly betterment order record, with all completed betterments, in the form of jigs, fixtures, etc.	From incoming cash sheets, with any sales made of the same.

Note: This investment account will always be increased from B–2, "Work in Progress"; therefore, it calls for a betterment order or some special form of betterment requisition.

The balance of this account should show the original cost of these items together with any subsequent increase in value from betterments. The current value at any time is the difference between the balance of this account and the balance of account E–6, "Reserve for Dies, Jigs, and Fixtures."

C–7. Shop Fixtures and Fittings

This account will represent the value of all shop fixtures and fittings, such as benches, cupboards, chairs, desks, together with all containing racks for stores-keeping, for tool cribs, etc. All items of this nature which are bought for the factory must first pass through general stores, being issued to the factory by betterment orders. The account will be handled as follows:

Charge	*Credit*
On opening the account, with the present book value of shop fixtures and fittings.	From incoming cash sheets, with any amount received in payment for shop fixtures and fittings as per analysis of sundry column.
From monthly betterment order record, with all monthly plant betterment orders chargeable to these items.	From journal voucher, with the difference between the selling price and the original cost of any shop fixtures and fittings plus any betterments when sold.
	From journal voucher, with the initial cost of any item when it becomes obsolete.

The balance of this account shows original cost of shop fixtures and fittings together with any subsequent increase in value from betterments. The current estimated value at any time is the difference between the balance of this account and the balance of E–7, "Reserve for Shop Fixtures and Fittings."

C–8. Miscellaneous Equipment

This is an investment account of a peculiar nature and one not subject to depreciation; therefore, no reserves are set up for it. It takes so much water to fill a siphon before it will operate and deliver water at the discharge end. With a given output and a given number of people employed, it takes just so much miscellaneous equipment to operate a plant. This miscellaneous equipment consists of such things as hammers, wrenches, twist drills, reamers, dies, taps, etc., and also brooms, pails, buckets, small trucks, tote boxes, etc. Assets of this nature are always recovered by the taking of a physical inventory; therefore, a holding account of this inventory must be maintained in order to preserve an equilibrium on inventory valuations

at the termination of the fiscal year. This account represents a standing inventory and is not affected during the year by any increase or decrease of items.

Charge	*Credit*
On opening the account, with the present book value of miscellaneous equipment.	From incoming cash received sheets, with any amount received in payment for miscellaneous equipment as per analysis of sundry column.
From journal voucher, with any increase in this equipment as shown by physical inventory from year to year.	From journal voucher, with any decrease in the amount of this equipment at subsequent inventory periods.

The balance of this account gives the cost of miscellaneous equipment as affected by any increases or decreases shown by subsequent inventories or sales.

C–9. Patterns

This account represents the value of patterns on hand at any time and should be handled conservatively, for it is a well-known fact that changes made in patterns are so rapid in most instances as to cause them to become worthless. These items must be handled through a controlling account, and written off on a fixed basis rather than to charge them up to expense at the time they are created. In other words, these items are distributed over some time period or on some fixed basis for the purpose of stabilizing costs. The account will be handled as follows:

Charge	*Credit*
On opening the account, with the present book value of patterns.	From journal voucher, with initial cost of discarded patterns.
From monthly betterment order record, with all completed betterments for same.	From incoming cash sheets, with any amount received in payment for patterns as per analysis of sundry column.

The balance of this account shows total initial cost of patterns, the current estimated value at any time being the difference between the balance of this account and the balance of E–8, "Reserve for Patterns."

C—10. Drawings

This account represents the value of drawings on hand at any time. All that was stated above in regard to patterns applies with equal or greater force to drawings, and the account is handled in the same way as Patterns account.

The balance of this account shows total initial cost of drawings, the current estimated value at any time being the difference between the balance of this account and the balance of E–9, "Reserve for Drawings."

C—11. Patents

There is perhaps no account on the general books of any company that is more questionable than that of patents. Their true worth is an absolutely unknown quantity, and tremendously fictitious values are often placed upon them to the ultimate detriment of the company's affairs. This account is handled as follows:

Charge	*Credit*
From voucher record, with actual cost to obtain patent as per sundry column which should include all legal expenses as well as patent fees.	From journal voucher, with the original book value of any patent which has expired or has been abandoned.
From journal voucher, with the actual cost or estimated value of a patent which is purchased.	From incoming cash sheet, with any amount received in payment for patents which are sold instead of being abandoned, as per sundry column.

The balance of this account shows the total initial cost of patents, the current estimated value at any time being

the difference between the balance of this account and the balance of E–10, "Reserve for Patents."

C–12. Advanced Expenses—Development and Experimental Work

In many lines of business a controlling account is necessary to cover what may be termed "Advanced Expenses" for development and experimental work. This account, when required, is purely an arbitrary one, dictated by conservatism for the purpose of stabilizing costs. In other words, the cost of development and experimental work for a product is held in this controlling account and spread over the life, or a portion of the life, of the product. This account oftentimes includes research work, especially of a laboratory nature.

By having an account of this character, it is possible to prorate monthly a certain amount for this kind of work, thereby putting it on the same basis as unexpired insurance, advertising, etc.

The account is handled as follows:

Charge	*Credit*
On opening the account, with any undistributed expense of this character.	From journal voucher, with the proper monthly distribution which should be charged directly into overhead or commercial expense as shown on the monthly prorating sheets.
From monthly betterment order record or a prorating sheet, with all expense chargeable to this kind of work.	

The balance of this account is the amount to be prorated to subsequent time periods. The time period and the amount absorbed into expense for each period may be changed from time to time as necessary, but only by authority of the board of directors or executive committee.

CHAPTER XV

CONTROLLING ACCOUNTS LIABILITY AND PROFIT AND LOSS ACCOUNTS

Continuing the illustration and explanation of the chart of controlling accounts, and giving in detail the source from which the debits and credits of each liability account and each profit and loss account are obtained.

CHAPTER XV

CONTROLLING ACCOUNTS
LIABILITY AND
PROFIT AND LOSS ACCOUNTS

LIABILITIES—D. CURRENT

D–1. Accounts Payable

This is the controlling account of the purchase ledger or purchase vouchers. In other words, it represents the total amount of money which the company owes its creditors. Postings are made to this account at the end of each month as follows:

Charge	*Credit*
From check record, with monthly total of the "Accounts Payable" column.	From voucher record, with monthly total of all purchases, as per "Accounts Payable" column.
From journal voucher, with any other items charged to purchase creditors, such as notes issued in payment, etc.	From journal voucher, with any other items credited to purchase creditors.
	From incoming cash sheet, with all cash received from purchase creditors, as per analysis of sundry column.

The balance of this account is the amount due purchase creditors. The aggregate balance of the purchase vouchers must agree with this balance which should be proven once a month by drawing off the balance from the unpaid vouchers.

D–2. Accounts Payable Datings

This is a very unusual account with most concerns and for this reason is not given on the chart (Form 92). It represents purchases under special agreements, where the invoice does not mature in thirty or sixty days as customary, but at a later date specifically indicated in the purchase contract.

D–3. Notes Payable

This account shows the company's liability for notes payable, and should be handled as follows:

Charge	*Credit*
From check record, with all payments on account of notes payable, as per "Notes Payable" column.	From incoming cash sheets, with monthly total of the "Notes Payable" column, representing all notes payable issued, discounted, and renewed.
From journal voucher, with any adjustments chargeable to notes payable by other than cash, as per monthly total of the "Notes Payable" column.	From journal voucher, with all renewals of notes by other than cash transactions, as per the monthly total of "Notes Payable" column.

Note: Upon the renewal of a note, a journal voucher must be made on which will be recorded the cancellation of the unpaid note or any portion thereof by the issue of a new note in its place. The amount of the old and new note will be charged and credited to this account, respectively. In the event of the new note being in excess of the old one, the excess, representing interest or a further payment to a purchase creditor, must be charged and credited to the proper account.

The balance of this account represents the amount of the company's liabilities for notes payable, and must agree with the total of unpaid notes still outstanding. It should be proven at least once a month against the unpaid notes.

D–4. Taxes Accrued

In the handling of this account, it must be remembered that taxes are usually paid at the end of the year. As it is not desirable to have all of this expense charged to the month in which it is paid, it should be prorated monthly. The account may be handled as follows:

Charge	*Credit*
On opening the account, with the accrued taxes to date, if any.	From journal voucher, with monthly taxes as per tax schedule on the monthly prorating sheet—one-twelfth each month.
From voucher record, with the amount of tax bills when received as per sundry column.	

Note: By handling the account in this way, it is not necessary to credit any reserve for taxes, as the account itself is practically a reserve.

The credit balance of this account represents the company's liability for taxes accrued but not due.

D–5. Interest Accrued—General

This account shows the liability for interest accrued on notes, etc., and should be handled as follows:

Charge	*Credit*
From check record, with the amount of cash paid for interest which has accrued, as per sundry column.	From journal voucher, with the monthly proportion of interest accrued on notes payable, as per interest schedule on the monthly prorating sheet.

Note: No interest which is paid in advance should go into this account, but it should be charged to "Advanced Expense—General," and through that account prorated into monthly expense.

The balance of this account represents the company's liability for interest accrued on notes payable.

D–6. Interest Accrued on Bonds

This account and the next account, D–7, "Interest Accrued on Mortgages," are handled in the same manner as D–5, "Interest Accrued—General."

Liabilities—E. Reserves

Theoretically and practically, reserves are established to separate from surplus a certain amount with which to cover losses such as expenditures for repairs, depreciations, and the renewal of various kinds of equipment. This is done as a conservative measure, as otherwise the available surplus would appear larger than it really is, and create a tendency to declare dividends not warranted, especially during dull times.

Monthly charges should be made against each reserve, and credited to overhead, so that no one particular time period will be unduly burdened for such expenditures. These expenditures can then be handled in whole or distributed over the different departments, so as to become a part of the departmental overheads.

It must be remembered that these reserves are legitimately withheld from profits, because the amounts they protect have been prorated over the product manufactured and thus charged into costs of production. In other words, the cost of goods has been increased by the amount charged to depreciation, for replacements, repairs, etc. Any commercial profit derived from sales, over and above this cost, is therefore true profit and not, as would otherwise be the case, a portion of the stockholder's investment which, hidden in profits, might be returned to him in the form of dividends.

As the name of each reserve account relating to tangible assets indicates its purpose and also the sources of debit and credit for the same, it will not be necessary to

describe every account. The following will serve to illustrate them all:

E–2. Reserve for Depreciation of Buildings

This account is typical of all reserve accounts for tangible assets, and is handled as follows:

Charge	*Credit*
From journal voucher, with monthly amount of repairs expended on buildings. From journal voucher, with the difference, if a loss, between the initial cost and the selling price of buildings sold.	From journal voucher, with monthly amounts of estimated depreciation on buildings, chargeable to overhead or commercial expense.

The credit balance of this account is the unused portion of the reserve.

In connection with the above, it may be said, that the titles of E–1, Real Estate; E–2, Buildings; E–3, Building Equipment; E–4, Office Furniture and Equipment; E–5, Machinery and Tools; E–6, Dies, Jigs and Fixtures; E–7, Shop Fixtures and Fittings; E–8, Patterns; and E–9, Drawings, are in each case clearly descriptive of the character of the accounts.

E–10. Reserve for Depreciation of Patents

Patents are not a tangible asset; therefore, this account must be treated differently from the foregoing. It shows the amount of depreciation set aside for patents, based on the life a patent has to run.

Charge	*Credit*
From journal voucher, with the difference, if a loss, between the initial cost and the selling price of any patent sold.	From journal voucher, with the monthly prorated amount of depreciation for patents, chargeable to overhead or commercial expense.

Note: In connection with this account, it should be borne in mind that the full life of a patent is seventeen years, and that, whatever the valuation of a patent is, it must be depreciated at least pro rata according to the time it has to run, so that at the end of its life the book valuation will be wiped out.

The credit balance of this account is the unused portion of the reserve.

E–11. Reserve for Bad Accounts

This account is handled as follows:

Charge	*Credit*
From journal voucher, with all accounts which are determined to be uncollectible.	From journal voucher, each month with one-twelfth of the estimated annual loss from uncollectible accounts. From incoming cash sheet, with any moneys collected on items shown on the debit side of this account.

The balance of this account shows the difference between the amounts set aside monthly to cover losses from bad debts and the actual losses sustained. At the end of the year the balance should be written off to profit and loss.

If any collections are made on accounts which had been written off in a preceding year, such collections should not be credited to this reserve account but to profit and loss.

E–12. Bond Redemption Fund

This account is credited monthly or quarterly, at the discretion of the board of directors, with an amount sufficient to provide for the redemption of the bonds at their maturity.

E–13. Obsolete Stock

This account should be handled as follows:

Charge	*Credit*
From journal voucher, with the inventory value of stock written off to obsolescence.	From journal voucher, with the estimated monthly amount required to cover the writing off of losses due to obsolescence of stock.

The balance of this account is the unused reserve for obsolescence.

E–14. Obsolete Equipment

This account is handled in exactly the same manner as obsolete stock.

Liabilities—F. Capital, Bonds, and Mortgages

Capital Stock Accounts

An account is sometimes opened with "Capital Stock Authorized," or some similar title, in order to bring on the books of account the total capitalization of the company. Speaking generally, however, any account representing capital stock should show only the stock that has actually been issued; that is to say, if the authorized capital stock of a company is $500,000 divided into $100,000 preferred and $400,000 common, and if all of the preferred, but only $300,000 of the common, is issued, the capital stock accounts should show the issue of $400,000 and not the entire capitalization of $500,000. In other words, the capital stock accounts should show only such an amount of the authorized capital stock as has been issued, and is actually outstanding.

Furthermore, when stock has been issued and paid for by a subscriber and is either donated to, or bought back by, the company, such stock becomes treasury stock, and does not in any way affect the capital stock accounts F–1

or F–2, but must be carried in a separate account as treasury stock as an asset (A–12 and A–13).

When stock has been issued but has not been paid for in full, it should be treated in the same manner as any other account sale, that is, it should be credited to Capital Stock and be charged to Accounts Receivable in the personal accounts ledger.

F–1. Capital Stock—Preferred

This account should be handled as follows:

Charge	*Credit*
From journal voucher, with any reduction in preferred stock, or any preferred stock forfeited for non-payment of purchase price.	From stock record book, the total preferred stock which has been issued.

The balance of this account represents the company's outstanding preferred stock.

F–2. Capital Stock—Common

This account would be handled in the same manner as F–1, and the balance represents the company's liability for outstanding common stock.

F–3. Bonds

Bonds will be carried in a holding account the same as F–1 and F–2, until redeemed by the company, when the account will be charged and cash credited. The balance of this account always shows the amount of outstanding bonds for which the company is liable.

F–4. Mortgages

Mortgages will be held in account F–4 until retired, at

which time this account should be charged from the voucher record and cash credited. The balance of this account always shows the amount of outstanding mortgages for which the company is liable.

F–13. Surplus

This account is a reservoir for holding all moneys made over and above actual costs of doing business, and also for holding certain amounts to cover contingencies, improvements, etc., not taken care of by reserve accounts.

Charge	*Credit*
From journal voucher, with amount of dividends declared by board of directors.	From journal voucher, with the balance of Profit and Loss—General to be carried to this account.
From journal voucher, with the disposition of any other amounts of surplus.	

Note: Under no circumstances can any entry be made to this account except by authorization of the board of directors.

The balance of this account is the undivided profits subject to the board of directors' disposal.

F–14. Dividends Declared

This account is a record of the dividends declared and paid, which should always be taken from surplus and not directly from profit and loss.

Charge	*Credit*
From check record, with all dividends paid in cash, as per sundry column.	From journal voucher, with the amount of dividends declared by the board of directors, as shown by the minute book, charging the same to surplus.
From journal voucher, all dividends paid in some other way than by cash.	

The balance of this account consists of dividends declared but not yet paid. As a general rule, dividends should never be declared unless means are available to pay them; therefore, there should never be a balance to this account save for the interval between the declaration and payment of dividends.

Profit and Loss—G. Revenues

G. Total Revenues

If a controlling account of all sales is desired, this account will be set up and represents the revenues from all sales, as shown by the sales analysis sheet and by the chart covering the various models made, and by any other record showing items sold. The account will be handled as follows:

Charge	*Credit*
From returned goods analysis sheet, with monthly totals at sales prices, of all sales returned.	From sales analysis sheet, with monthly totals of all sales.
From sales analysis sheet, with the monthly totals of the various adjustments named thereon.	

The account is balanced out each month into Monthly Profit and Loss (K–1).

G–1. Road Racer Model

If it were thought better to have a running controlling account for each item in the classification of the sales analysis sheet, or the chart, any account from G–1 to G–14 inclusive would be handled according to the following method:

Charge	*Credit*
From returned goods analysis sheet, with monthly total of all sales returned at sales prices for road racer model.	From sales analysis sheet, with monthly total of all sales of road racer model.
From sales analysis sheet, with monthly totals of the adjustments named thereon for road racer model.	

The account is balanced out each month into the Monthly Profit and Loss account.

Profit and Loss—H. Costs

H. Cost of Sales

This is the analysis of costs for the sales items, and consequently, whatever method is used, the classification under "H" must be exactly the same as illustrated under "G."

If the costs of sales are handled in one master account, the debits and credits will be as follows:

Charge	*Credit*
From the cost columns of the sales analysis sheet, with monthly cost totals of all goods sold.	From the cost columns of the returned goods sales analysis sheet, with monthly cost totals of all goods sold and returned.

The balance of this account represents the cost of goods sold, and is closed out each month to the debit of Monthly Profit and Loss (K–1).

If each item in the classification were treated separately, any account from H–1 to H–14 would be handled the same as above.*

*In connection with the "G" and "H" accounts, reference is again made to the sales analysis sheet which gives the classification shown on the chart of controlling accounts. This sales analysis sheet is used, not only for the report of sales and cost of sales, but the same set of sheets is used for recording all returned goods which must be classified on their return just as they are in sales when going out.

PROFIT AND LOSS—J. EXPENSES

J–1. Commercial or Office Expense

This account will include all expenses chargeable to the commercial end of the business, such as commercial labor, commercial material, and commercial general expense, as outlined in Chapter XIII, "Commercial or Office Accounting." This account, in total, is handled as follows:

Charge	*Credit*
From voucher record, with the total amount of commercial expense as shown by the "Commercial Expense" column.	From monthly distribution sheet, with monthly total of commercial expense as shown on the same, this being the grand total of the subsidiary ledger commercial accounts which are chargeable to Profit and Loss.
From journal voucher, with any commercial expense prorated over the business not shown on voucher record.	

This account is balanced out into Monthly Profit and Loss.

J–2. Overhead

The one great object of this account is to stabilize factory costs, by the equitable distribution of overheads on an hourly rate basis or on a percentage basis. It is highly undesirable to change these rates more often than is absolutely necessary, as the change of an overhead rate in a business means a change in the inventory valuation of all "Work in Progress," "Component Stores," and "Finished Stores." For instance, if the actual overheads for any particular month as shown on the overhead distribution sheet were $100,000, and if the amount on a percentage or other basis, actually absorbed into production, as shown on the production sheets, were $97,000, there would be

$3,000 to be disposed of in either one of two ways: first, it can be taken from this account and wiped out through Profit and Loss, or second, a holding account can be created under B, "Assets—Inventory," in order to allow time for showing whether or not the percentage basis or the hourly rate basis should be changed. In this way the amount spent for overhead would be undistributed expense that remained as an asset, the same as "Advanced Expenses—Insurance," "Salesmen," etc.

This account will embrace all non-productive labor, non-productive material, and manufacturing general expense, and will control the subsidiary ledger factory overhead accounts. Its purpose is to wipe out any difference through Profit and Loss that may exist between the overhead actually applied during the month and that actually created by expenditures. The account should be handled as follows:

Charge	*Credit*
From voucher record, with the total monthly amount as shown by "Overhead" column.	From production and betterment order record, with the total amount of factory overhead prorated to production and betterment orders during the month.
From journal voucher, with all other charges or distributions of overhead expenditure not included in the voucher record. These charges will be the same as shown on the subsidiary ledger overhead accounts, and will agree with the total general expense shown on monthly distribution sheet.	

The balance of this account is any unused or excess overhead which is necessarily carried, together with commercial expense, into Monthly Profit and Loss.

K—Profit and Loss

K–1. Monthly Profit and Loss

This account will represent the monthly profit or loss in the business, and will be closed out monthly into Profit and Loss—General. It should be handled as follows:

Charge	*Credit*
From journal voucher, with cost of sales, crediting the same to cost accounts.	From journal voucher, with revenue of sales, charging the same to Revenues.
From journal voucher, with expenses, both commercial and unused or excess overhead.	

The balance of this account is the net monthly profit or loss, and will be carried into Profit and Loss—General.

K–2. Profit and Loss—General

This account is provided for the accumulation of the entries of monthly profit and loss. The account should be handled as follows:

Charge	*Credit*
From journal voucher, with the monthly balance of Profit and Loss, if a loss.	From journal voucher, with the monthly balance of Profit and Loss, if a profit.

The balance of this account is carried to surplus quarterly, semiannually, or annually, according to the discretion of the board of directors.

This is as far as the comptroller or general accountant should handle the accounts shown on the chart of controlling accounts.

No transfer from the accumulated Profit and Loss—General to "Surplus," should be made unless by the authorization of the board of directors or executive committee; nor should any authorization to transfer amounts from "Surplus" to "Dividends" be given except by the board of directors or executive committee.

It must also be borne in mind that reserves for depreciations, etc., are really undivided profits, and therefore, the percentages employed for the various assets must also be authorized by the board of directors or executive committee and duly recorded.

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CHAPTER XVI

TAKING THE INVENTORY

Showing the development of a duplicate tag method, together with complete specifications for actually taking an inventory.

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TAKING THE INVENTORY

Preliminary Steps

To take an inventory for valuations only is one thing, but to take an inventory for the purpose of perpetuating it by count as well as by valuations, at the same time establishing a definite control of investments and production, is an entirely different proposition, and one that requires definite plans carefully worked out in advance. These plans must embrace not only the methods to be employed in the actual taking of the inventory, but also a temporary organization for doing the work, a complete classification for production and accounting purposes, and a previously prepared pricing system as well. Further, the plant itself should be physically prepared for the taking of an inventory by issuing explicit instructions, sufficiently in advance of the inventory period, to the superintendent and foremen to clean up the various departments and finish as far as possible all production and betterment orders standing as work in progress.

Too often inventory taking is considered as a sort of necessary evil to be disposed of along the lines of least resistance, usually by turning this work over to foremen and clerks with little or no instruction or preparation from either an accounting or production point of view.

When inventories are taken in this way, the work of counting, sorting, and classifying is usually done in such a careless manner as to make the results inaccurate and misleading, thus necessitating many subsequent adjustments.

It is strange why to so many people a dollar in cash appears so differently from a dollar represented by material for which cash has been paid. It is even more strange that very often executives in the taking of an inventory will not consider the fact that their material and property values are just as important, just as real, just as necessary to the profit and loss statement as is cash in bank or accounts receivable, and it is difficult to understand the laxity with which such property values are frequently handled as compared with the careful methods used for the protection of actual cash in the drawer and of cash values in the shape of book accounts.

The first work in connection with inventory taking is to taper off on production orders during the two or three weeks previous to the inventory date, and delay the starting of new orders as much as practicable so there will be as little material and as little work in progress in the factory as is consistent with reasonable factory practice and sales conditions. The works or chief engineer should also be conservative in putting new betterment orders into the factory just previous to an inventory period.

More important perhaps than this is the work of getting all condemned components out of work in process, and all obsolete equipment out of the factory. This should cover not only materials and components manufactured, but also gages, fixtures, all kinds of tools, and in addition, all machinery, belting, etc., together with the thousand and one small items usually found under benches, in cupboards, etc., that will never be used again, but for disposing of which no one ever seems willing to take the responsibility. These things should all be gotten together and gone over by the engineers and management jointly, if necessary, in order to arrive at a decision for their disposition and thus make possible the cleaning up of the factory.

Formal Announcement

It is best to make a formal announcement of the taking of inventory, stating when, by whom, and how it is to be taken. The following form is given as an example:

INVENTORY SPECIFICATIONS

November 1, 1916

1. The Rogers Motor Works will be closed from Friday night, December 29, 1916 until Tuesday morning, January 2, 1917, for the purpose of taking inventory.

2. The following Inventory Committee has been appointed:

William Blake, Engineering Department
James F. Porter, Production Department
Eben Williams, Superintendent
John D. Ropes, Works Engineer
Harvey Adams, Chief Inspector
Enoch Delmer, Accounting Department
Wallace James, Purchasing Department
Allen Turner, Chairman

3. The inventory of the Rogers Motor Works will be taken as of December 31, 1916 by the duplicate tag system; i.e., each and every lot and kind of material will be taken by a count under instructions given hereafter, and as soon as counted, weighed, or otherwise classified, the data and information concerning each particular lot, piece, or kind of material, *will be written with indelible pencil upon an inventory tag in duplicate.* The tag will be wired or otherwise attached to the material so counted, weighed, or otherwise classified, and the duplicate will be sent to the headquarters of the Inventory Committee as soon as the taking of any particular lot of material or section is completed.

4. Each superintendent, foreman, and assistant foreman will have charge of that section of the plant or office which comes under his daily supervision. Each of these will be fully assisted by the Inventory Committee in organizing for the taking of inventory. It is desired that as many groups of men as can be used be put on this work.

5. The importance of a correct inventory of the Rogers Motor Works cannot be overestimated, and these instructions are given out at this time in order that every superintendent, foreman, and department head may have ample time to study out and prepare for his particular duties.

6. All machines and fixed equipment throughout the plant, including furniture and fittings, etc., will be numbered individually by a brass tag or by having numbers painted upon them, so that all equipment of this character, including engines, boilers, dynamos, motors, pumps, transmission machinery, etc., can be inventoried without shutting down the plant.

7. *Tags must not in any instance be destroyed. All tags that are given out will be charged by their numbers to the parties receiving them so that any tag number that becomes lost or misplaced may be located. If a tag is spoiled mark it "void" and then turn it in.*

8. As soon as any superintendent, foreman, sub-foreman, or assistant, has gone over all of the space allotted to him and made sure that every item has been covered by a tag, he will immediately report to the Inventory Committee so that other inventory work may be assigned if necessary.

9. No tags may be pulled at any point in the plant until the signal for release has gone out to the factory from the Inventory Committee. As soon as tags are pulled it constitutes a release of the items covered, and preparation may be at once made to return such items to regular operation. Upon the pulling of tags, they are to be at once sent to the

Inventory Committee in the main office where they will immediately be matched up by numbers with the duplicate to see that no numbers have been lost or destroyed.

10. All equipment, tools, or material, of any kind invoiced to the company prior to January 1, 1917 and not received until after this date, must be included in the inventory, and all such invoices must be plainly stamped "season of 1916 included in inventory."

11. All equipment, tools, or material invoiced prior to January 1, 1917 but not unloaded until after January 1, 1917, must be inventoried from the invoice and every precaution must be taken to keep such goods entirely separate from other inventoried items until after the inventory tags have been checked up.

12. Items received prior to January 1, 1917 but not bearing an invoice date until on or after January 1, must not be included in the inventory.

13. Superintendents, foremen, and assistant foremen are hereby instructed to clean up on the work in their departments in every way possible prior to the taking of the inventory and to have ready Saturday morning, December 30, 1916, all materials, works, etc., sorted by kinds and arranged, piled or stacked ready for counting or weighing.

14. The chief inspector is hereby instructed to have the inspection work cleaned up by Saturday morning, December 30, 1916, working a special inspection force all night on Friday, the 29th of December, if necessary, to accomplish this. All finished components must be in component stores for the taking of inventory.

15. The production department is hereby instructed to issue from general stores the minimum amount of material possible on Thursday, December 28, and Friday, December 29.

16. The production engineer is hereby instructed to

transfer on the 28th and 29th of December, all surplus tools, fixtures, etc., from crib or shop stores to general tool stores, so that work in taking inventory and classifying it may be minimized in every possible way; also to transfer from crib or shop stores to general stores before December 29, 1916 any and all supplies that are a surplus, and to have all crib cards show "Balance on Hand" in each crib and have maximum and minimum amounts established.

17. All superintendents, engineers, foremen, assistant foremen, and factory clerks must give their undivided time and attention to the taking of this inventory as between Saturday morning, December 30, 1916, and Tuesday morning, January 2, 1917. Special instructions for organization, and a chart covering same, will be issued by the Inventory Committee as a guide in taking the inventory.

18. The foremen and assistant foremen of each department will supervise the weighing, counting, and recording of all items inventoried in their department, and will be held strictly accountable for correct numbering, naming, location, etc. In preparation for inventory, they must collect all small tools, cutters, fixtures, etc., and get them into the tool cribs or on benches properly arranged by "kinds" for counting.

19. Each department will be provided with an engineer or engineers to assist foremen and assistant foremen in giving a complete description of each part and the next operation to be done and any change in sequence. *This is of the utmost importance in connection with production after January 1, 1917,* as upon the correctness of the inventory, showing the number of pieces done up to any given operation, schedules for the work throughout the factory must be adjusted.

20. The inspection department, the production department, and the salvage department, are hereby instructed to work as closely together during the entire month of De-

cember as possible in order to sift out from "Work in Progress" each and every component that is completely condemned and beyond repair.

21. The inspection department is hereby instructed to take a complete inventory in detail of all components that are imperfect but subject to repairs, separating each component in a class by itself and showing on each component the operation next to be done. In others words, all rejected work that is subject to repairs must be totaled into a separate inventory figure. The responsibility for this will rest entirely upon the inspection department.

22. Should any foreman find in his department any materials, tools, or fixtures, etc., the value of which is questionable, he, in conjunction with the engineer appointed to his division, is hereby authorized to give an *estimated value.* This must be written on the tag in indelible pencil at the time the estimate is made, together with the word "Estimate" to precede the amount.

23. *Special instructions are hereby given and authorization made to place all obsolete components and scrap in the salvage department on or before inventory,* and it is reiterated here that the inspection department is instructed to see that all obsolete stock and condemned components are put in the salvage department as rapidly as possible during the entire month of December. If, however, any condemned items are found that have not been disposed of, full particulars as to the condition of such items must be specially written on the tag and marked "Special" so as to call attention to it.

24. The general stores keeper and the tool stores keeper are hereby instructed to make a complete classification of all materials and tools on hand which for any reasons have become obsolete in order that the purchasing department may dispose of them.

25. On the night of December 29, 1916, the superintendent of assembly must return to component stores all finished components that have not been assembled.

26. After the inventory of any section allotted to a superintendent or his foreman has been completed, the superintendent or foreman must sign a statement to the effect that the inventory has been completed to the best of his knowledge and belief, and immediately send it to the Inventory Committee. This statement is necessary so that a record may be on file for insurance and accounting purposes.

27. If stock cannot be weighed or counted, a careful estimate must be made by the superintendent of the department in which the estimate is required and the tag marked "Estimate" and signed by him as an approval of it.

28. The following assignments have been made: (Detailed assignments to each floor of each building should follow.)

Organizing the Force

Each building should be designated by a letter and each floor by a number. Then, opposite the building letters, plus the number, should be written the name of the man who is to be in charge of that particular section for the taking of the inventory, followed by the names of all special assistants that may be required, together with the number of regular employees that will be necessary to count, weigh, and handle the materials to be inventoried—all of which is merely preparatory work on the part of the engineers, superintendents, and processing department heads. It is also highly desirable that foremen or department heads should be made responsible for this work in their respective departments—supplemented, where necessary, by engineers and draftsmen to act as assistants.

Classification of Assets

The next thing of importance is the classification of assets which the inventory will include, which must be the same classification used on the balance sheet under "Assets," details of which can be found in Chapter XIV, "Controlling Accounts," as follows:

A. General Stores
B. Work in Progress—Production Orders
C. Work in Progress—Betterment Orders
D. Work in Progress—Components Rejected for Repairs
E. Component Stores
F. Finished Stores
G. Shop Stores
H. Miscellaneous Equipment (See controlling account C–8; show per cent used.)
I. Real Estate (by plots)
J. Buildings
K. Building Equipment
L. Office Furniture and Equipment
M. Machinery and Tools
N. Dies, Jigs, Fixtures, and Gages
O. Power Plant
P. Shop Fixtures and Fittings
Q. Patterns
R. Drawings
S. Railroad
T. Railroad Equipment

Each and every item in the factory which constitutes a fixed or permanent asset as shown by the balance sheet classification under "Investments," consisting of items from "I" to "T" inclusive, must have for its identification wherever possible, a number attached to it, this number serving

two purposes—one for identification in case of transfer from one geographical point to another, and one as identification for valuations from year to year. By this method, means are provided for obtaining a proof of loss in case of fire, and for establishing and maintaining a perpetual inventory on permanent investment assets. Once the assets of the plant have been inventoried and numbered in this manner, it will never be necessary to retake the inventory physically, the entire scheme being protected by betterment orders as they are completed from time to time and added to these items, each item being numbered at the time it is completed and put to use in the plant and the fact being shown by a proper record.

Therefore, as this classification—which is the general classification of controlling accounts—represents the inventory values on the balance sheet, the entire inventory must be taken and classified accordingly, and the letter symbolizing the classification to which the item inventoried belongs, must be shown on the inventory tags illustrated in Form 93.

In connection with the material kept in general stores, a supplementary classification can be used. For instance, if general stores is represented by "A," after this could be written either the name of the items according to the classified index of general stores, shown in Chapter IV, or a Dewey decimal number may be used, as in Form 95. In the latter case, "A" would mean general stores, 7 could mean "steel," and .1 "high speed steel." In other words, A–7.1 would indicate a high speed steel in general stores. Any one of several arrangements of this kind can be created to meet particular requirements.

In the classification under "Work in Progress" a split is made; i.e., it is divided into "Work in Progress—Production Orders"; "Work in Progress—Betterment

Orders"; and "Work in Progress—Components Rejected for Repairs." It is better at an inventory period to divide "Work in Progress" into this classification rather than to take it as one account, for the reason that it gives opportunity for a check-up on production and production schedules and also on the tools required for same. Hence, this classification can be used by the production and tools departments for inventory purposes.

Pricing the Inventory

In order to make sure that valuations are as nearly correct as possible, the following departments should be called upon to assist the inventory committee in the matter of pricing.

The pricing of all raw materials, general supplies, etc., bought outside and located in general stores, should be obtained from the purchasing department in conjunction with the general stores records.

The pricing of tools, fixtures, cutters, and gages, made in the factory, should be obtained from the accounting department; except where estimating is required, in which case the valuation is obtained from the engineering department.

The pricing of all machine tools, transmission machinery, transportation equipment, etc., covered by identification or inventory numbers, should be obtained from the accounting department and the works engineer.

The inventory committee should be given access to the different departments, and the latter should be authorized and instructed to assist the inventory committee in every way possible in obtaining a correct pricing of all inventoried items.

The price to be used on all raw materials should be the last purchase price from any regular source of supply,

irrespective of what may have been paid for the actual material on hand.

The price of all work in progress should be the labor cost plus the material cost, plus regular overhead.

The price of all components and finished stores should be the cost price of the last regular production order for same.

The price of all equipment should be the betterment or purchase order price and must include any regular equipment, freight, and installation expense.

No depreciations should be applied in placing valuations upon fixed assets; that is, the assets are valued as they stand.

Inventory Tag

The design of the inventory tag is such that when the stub is removed at the perforated line it leaves a standard 4 x 6 card, in duplicate, thus permitting the inventory tags to be filed in a regular 4 x 6 filing cabinet. If this is handled properly it will greatly facilitate pricing and extension work, and will leave the inventory in a perfectly classified condition on the original tags. By using a tag of this character all the help available can be used to advantage as it gives opportunity to create a much bigger organization for the taking of inventory than is usually employed.

The tag has two prime divisions (Form 93), arranged in such a manner that either one or the other side of the tag can be used for any and all kinds of items to be inventoried. Under the heading "Processed Work to Be Entered Here" must be written up all work in progress and all component stores, while the labor cost, material cost and overhead cost are entered on the lines provided for this purpose.

On the other side of the tag, under the heading "Write

All General Stores and Equipment Here," are provided captions to take care of any and all items in the plant, their description and serial number, and also whether the item is "In" or "Out of Use." In taking supplies, materials, etc., the "Unit of Measure" must be shown without exception as well as the price per unit of measure.

These tags are all numbered and attached to the particular items covered. When the tag is pulled, the stub with the number on it will be left on the item inventoried; therefore, it is very essential that the location be carefully defined as provided for on the tag, so that any item regarding which a dispute arises, may be readily located. Each tag must show by the word "Classification" the exact alphabetical division to which the item inventoried belongs.

As soon as the inventory is completed and all tags are pulled, they will immediately be sorted according to this classification, and divided among several groups of pricers, each group possessing the necessary data or experience to do this work correctly.

Disposition of Tags

As soon as the inventory has been classified and indexed, one set of priced cards should be arranged in a filing cabinet in 4 x 6 drawers and kept as a permanent record for the accounting department to use either as reference matter regarding valuations or as reference matter in case of fire, as by this inventory proof of loss can always be obtained in so far as all fixed investments, etc., are concerned.

The duplicate set of tags should be divided up. All those relating to production should be sent to the production department, to check up their production records. Those for betterment orders should be sent to the chief engineer or works engineer, and those for stores to the

stores recorder. After being checked, the duplicate sets can be destroyed, but the original set of tags should be kept in a vault for safety.

Equipment Record

It is necessary either for the works manager or the accounting department to have a complete record of all the equipment in the plant. Form 94 has been provided, to show any item of equipment covered by an inventory number. It is a 5 x 8 card printed on both sides; the front being for data relative to a description of the item together with the various numbers belonging to it, its location, and also the date of installation, etc., where new equipment is provided. Several lines are given for this information, so that entries may be made on the same card whenever equipment is changed geographically from one location to another, thus providing a running record for such transfers. The back of the card is reserved for values. For purchases outside, the data come under "Purchase Cost" section; when manufactured, under the "Manufactured Cost" section; between these two sections columns are provided to register any additional values together with their date and order number.

On the right of the card, space is arranged for keeping a record of the repairs showing the date repairs were made, and the amount.

With this record completed, classified, and indexed, a perpetual inventory may be checked off and made up.

As a general thing, this record would be practically the only one that is required for any ordinary plant. Should, however, a different captioning be needed to cover any particular item or items, it can easily be arranged provided that the method of keeping running costs, additional values, and repair costs remains the same. This

is important for the reason that under certain classes of machinery an annual depreciation is written off on a percentage basis. The repair costs shown on these records, either as against an individual machine or against a group of machines, will indicate whether the percentage used to cover depreciations and repairs is too large or too small, by simply taking the total amount of repair costs for any period of time and checking it against the amount that is set aside as a reserve for depreciation.

CHAPTER XVII

THE WORK OF THE SYSTEMATIZER

Showing the difference between systematizing and accounting, and outlining the sphere of the systematizer's work.

CHAPTER XVII

THE WORK OF THE SYSTEMATIZER

Relation Between Standardized Accounting and Systematizing

As stated in the preface, this volume was planned and developed as a work on accountancy rather than on systematization; but in discussing the various phases of accountancy, due consideration has been given to the fact that a certain amount of work is to be done from a purely systematizing point of view so that the operations of the business may properly co-ordinate with its accounting.

In other words, the standardized methods of accounting set forth herein do not interfere in any way with the work of the systematizer. On the contrary, there is ample opportunity for the latter to develop systems that will meet the requirements of a specific business and will also fit into the methods of accounting outlined in this volume. This is so because the accounting methods presented in the foregoing chapters can be applied to almost any manufacturing business, not only in principle but in much of the detail offered; while in the things that concern the systematizer, there is much less opportunity for standardization, and it is practically impossible to devise a detailed system that will apply to any considerable number of manufacturing businesses in different lines.

Special Features of the Systematizer's Work

To illustrate the possibilities for the systematizer, a few

special features that properly belong to his field may be mentioned. The subject of "organization," for instance, is not treated in this book further than to show the relation of the accounting department to the general organization, as illustrated by a chart of departmental divisions. A systematizer would take this chart and from it draw up specifications detailing the duties of each department head and the interdepartmental relations, especially in connection with office work.

Again, this volume has not given a detailed method for making the sales analysis required for a monthly summary, or for the routing and handling of sales orders, nor has it gone into the details incident to shipping. All of these are responsibilities of the sales department and worthy of special consideration in connection with system work.

A matter of no small importance is the compilation of standard data concerning drawings, blue-prints, etc., especially in laboratory and experimental work. None of this is gone into in this work; it belongs to the field of systematization and is entirely foreign to the accounting discussed in the foregoing chapters.

A wonderful opportunity is offered the office man, or systematizer, in connection with the mailing and filing department. Here it is his function to design and develop such methods and systems as will facilitate the opening and distribution of mail, and the handling and filing of correspondence, etc., to meet the particular requirements of each individual business.

In nearly all manufacturing establishments, and especially in the larger concerns, a vast amount of statistics is often handled entirely outside of the accounting department. The figures used in these statistics are frequently derived from the regular books of account, and sometimes they are combinations of these figures with those obtained

from other sources. In some institutions, a statistical bureau is considered of almost as much value as the accounting department. This is another type of work that must be designed with particular reference to the business it is to cover, and which lies beyond the functions of the accountant.

Office Appliances

The suggestions of the foregoing paragraphs offer a world of opportunity for the ingenuity of the systematizer. Furthermore, many kinds of appliances have been invented to facilitate the routine work of the office. Some of these are most meritorious; most of them are good; but they cannot all be used in each and every business, and it remains for the systematizer to prescribe such appliances as are best fitted to the particular business under consideration.

As examples of such labor-saving devices, particular reference may be made to the dictaphone; to the various kinds of adding and computing machines; to the very intricate calculating and accounting machines, such as the Powers and Hollerith; and to the various devices employed for the opening and sealing of letters, registering of the same, etc., to say nothing of the various kinds of typewriters, filing cases, etc., that have been gotten up to take care of individual and special requirements. The specification and installation of all such equipment come under the head of systematizing rather than accounting, although the accounting work should be so designed as to take advantage of any and all mechanical means for compiling, sorting, and distributing figures.

Finally, it is a very special kind of system work to design the forms, headings, etc., under which tabulations shall be made on such accounting machines as the Powers

and Hollerith. These machines not only cover the regular accounting work, as indicated in the foregoing chapters, but also a large amount of statistical data. None of these forms, headings, etc., could be standardized, but must be prepared to meet special requirements.

The author, in concluding his work, is especially desirous of calling attention to these facts in order that there may be no misunderstanding as to the character and scope of the work. Also, he wishes to emphasize the fact that this book does not aim to be and cannot be a panacea for all manufacturing ills, but rather confines itself to specific lines of accountancy, diverging from these only in so far as certain shop practices in connection with industrial engineering are necessary to make clear the accounting principles and practices set forth, and the dependence of the one on the other.

FORMS

FINANCIAL STATEMENTS AND REPORTS

(Forms referred to in Chapter II)

BALANCE SHEET

Assets	Amounts	From Last Month		From Last Year	
		Increase	Decrease	Increase	Decrease
CURRENT:					
Cash in Banks	$25,070.20	.....	$6,526.98	.....	.....
Petty Cash	200.00	.....	.....	.....	.....
Accounts Receivable	120,172.80	$20,610.00	.....	.....	.....
Accounts Receivable Past Due	14,280.70	7,314.00	.....	.....	.....
Accounts Receivable Consigned	3,280.00	.....	7,270.00	.....	.....
Accounts Receivable Suspense	1,090.20	212.58	.....	.....	.....
Notes Receivable	6,602.00	512.25	.....	.....	.....
Advanced Expenses Insurance	3,192.00	.....	798.00	.....	.....
Advanced Expenses Advertising	2,166.20	.....	484.00	.....	.....
Advanced Expenses Salesmen	870.00	.....	350.00	.....	.....
Treasury Bonds	.....	.....	.....	.....	.....
Treasury Stock Preferred	7,000.00	.....	.....	.....	.....
Treasury Stock Common	14,000.00	.....	.....	.....	.....
Total	*$197,924.10*	*$28,648.83*	*$15,428.98*	.....	.....
	Net	*13,219.85*	.....	.....	.....
INVENTORY:					
General Stores	$112,490.00	$23,516.99	.....	.....	.....
Work in Progress	47,153.15	.....	$17,127.55	.....	.....
Semi-Finished Stores	67,510.00	.....	13,021.25	.....	.....
Finished Stores	56,410.55	.....	1,814.38	.....	.....
Finished Stores (Branches)	.....	.....	.....	.....	.....
Total	*$283,563.70*	*$23,516.99*	*$31,963.18*	.....	.....
	Net	.....	*8,446.19*	.....	.....
INVESTMENT:					
Real Estate	$40,000.00	.....	.....	.....	.....
Buildings	118,600.00	.....	.....	.....	.....
Buildings Equipment	26,700.00	$324.01	.....	.....	.....
Office Furniture and Equipment	8,970.60	1,100.00	.....	.....	.....
Machinery and Tools	138,677.72	1,890.15	.....	.....	.....
Dies and Jigs	9,426.10	1,538.74	.....	.....	.....
Shop Fixtures and Fittings	11,286.50	320.00	.....	.....	.....
Miscellaneous Equipment	15,297.65	.....	.....	.....	.....
Patterns	4,200.79	.....	.....	.....	.....
Drawings	2,100.00	270.00	.....	.....	.....
Patents	1,000.00	.....	.....	.....	.....
Experimental and Development	1,896.00	.....	.....	.....	.....
Good-Will and Agencies	.....	.....	.....	.....	.....
Total	*$378,155.36*	*$5,442.90*	.....	.....	.....
Total Assets	*$859,643.16*	*$57,608.72*	*$47,392.16*	.....	.....
	Net	*10,216.56*	.....	.....	.....

Form 1.

Month of January, 31 days, 1917

Liabilities	Amounts	From Last Month		From Last Year	
		Increase	Decrease	Increase	Decrease
CURRENT:					
Accounts Payable Current	$109,627.68	$12,776.55	.....	.....	.....
Accounts Payable Datings	20,180.00	3,100.00	.....	.....	.....
Notes Payable	40,000.00	.....	$22,600.00	.....	.....
Taxes Accrued	560.00	87.45	.....	.....	.....
Interest Accrued General	318.10	47.37	.....	.....	.....
Interest Accrued on Bonds	.....	.....	.....	.....	.....
Interest Accrued on Mortgages	.....	.....	.....	.....	.....
Total	*$170,685.78*	*$16,011.87*	*$22,600.00*	.....	.....
	Net		*6,588.63*	.....	.....
RESERVES:					
Reserve for Real Estate	$266.66	$33.33	.....	.....	.....
Reserve for Buildings	1,550.66	177.08	.....	.....	.....
Reserve for Building Equipment	620.60	45.75	.....	.....	.....
Reserve for Office Fur. & Equipment	346.89	20.01	.....	.....	.....
Reserve for Machy. & Tools	5,150.48	550.33	.....	.....	.....
Reserve for Dies & Jigs	182.60	46.82	.....	.....	.....
Reserve for Shop Fix. & Fittings	939.22	108.11	.....	.....	.....
Reserve for Patterns	199.41	20.05	.....	.....	.....
Reserve for Drawings	179.20	14.75	.....	.....	.....
Reserve for Patents	.....	.....	.....	.....	.....
Reserve for Bad Accounts	6,666.66	833.33	.....	.....	.....
Bond Redemption Fund	.....	.....	.....	.....	.....
Total	*$16,102.38*	*$1,849.56*	.....	.....	.....
CAPITAL, BONDS & MORTGAGES:					
Capital Stock Preferred	$200,000.00	.....	.....	.....	.....
Capital Stock Common	400,000.00	.....	.....	.....	.....
Bonds	.....	.....	.....	.....	.....
Mortgages	.....	.....	.....	.....	.....
Total	*$600,000.00*	.....	.....	.....	.....
Total Liabilities	*$786,788.16*	*$17,860.93*	*$22,600.00*	.....	.....
	Net		*4,739.07*	.....	.....
SURPLUS AND DIVIDENDS					
Profit and Loss General	$63,532.72	$13,714.04	.....	.....	.....
Surplus	.....	.....	.....	.....	.....
Dividends (Accrued) Preferred	9,322.28	1,241.59	.....	.....	.....
Dividends Common	.....	.....	.....	.....	.....
Total	*$72,855.00*	*$14,955.63*	.....	.....	.....
Net Liabilities	*$859,643.16*	*$10,216.56*	.....	.....	.....

(a) Balance Sheet

PROFIT AND LOSS — Month of January, 31 days, 1917

Analysis	Month of Jan. 1917	From Last Month		Eight Months To Date	To Date Same Period Last Year
		Increase	Decrease		
REVENUE:					
Road Racer Model...	$2,814.15	.....	$285.00	$7,180.75	.....
Roadster Model.....	15,319.80	$7,680.60	.....	44,780.00	.....
Special Model.....	7,420.00	4,090.75	.....	21,090.70	.....
Jobbing Model.....	9,905.25	.....	1,770.20	40,275.15	.....
Ladies' Model.....	1,179.90	190.00	.....	4,170.00	.....
Juvenile's Model.....	480.00	.....	66.00	3,280.00	.....
Racer Model.....	420.90	.....	.....	1,110.00	.....
Motorcycle 4 H. P. Service	43,443.25	34,762.08	.....	216,210.90	.....
Motorcycle 4 H. P. Tourist	33,326.45	.....	20,106.97	377,950.00	.....
Motorcycle 6 H. P Twin	16,690.30	11,949.00	.....	42,675.85	.....
Repairs	3,411.90	1,320.78	.....	9,256.00	.....
Parts, Semi-Finished Stores	7,927.15	5,050.10	.....	15,816.25	.....
General Stores.....	454.95	.....	70.00	2,009.15	.....
Unclassified	.....	.....	.....	.....	.....
Total	*$148,794.00*	*$65,043.31*	*$22,298.17*	*$785,804.75*	.....
	Net	*42,745.14*	.....	.....	.....
COSTS OF REVENUE:					
Road Racer Model...	$2,082.47	.....	$210.00	$5,313.20	.....
Roadster Model.....	12,049.44	$6,130.80	.....	30,002.60	.....
Special Model.....	5,727.52	3,149.30	.....	15,184.80	.....
Jobbing Model.....	7,825.14	.....	1,398.46	35,039.20	.....
Ladies' Model.....	896.72	144.40	.....	2,780.00	.....
Juvenile's Model.....	367.60	.....	50.82	1,870.00	.....
Racer Model.....	311.46	.....	.....	810.30	.....
Motorcycle 4 H. P. Service	34,325.85	27,666.79	.....	170,113.80	.....
Motorcycle 4 H. P. Tourist	26,250.80	.....	16,085.57	287,111.13	.....
Motorcycle 6 H. P. Twin	13,262.00	9,559.20	.....	30,736.00	.....
Repairs	2,217.23	858.00	.....	5,224.00	.....
Parts, Semi-Finished Stores	4,782.77	2,259.04	.....	9,115.12	.....
General Stores.....	397.25	.....	59.50	1,709.10	.....
Unclassified	.....	.....	.....	.....	.....
Total	*$110,496.25*	*$49,767.53*	*$17,804.35*	*$595,009.25*	.....
	Net	*31,963.18*	.....	.....	.....
Gross Profit.....	*$32,297.75*	.....	.....	.....	.....
PROFIT AND LOSS:					
Net Commercial Expense	$17,285.30	$852.50	.....	$112,260.25	.....
Overhead {Unused / Excess}*	56.82	.....	$259.85	5,680.25	.....
Replacements & Guarantees	.....	.....	.....	.....	.....
Net Total Expense...	*$17,342.12*	*$852.50*	*$259.85*	*$117,940.50*	.....
	Net	*592.65*	.....	.....	.....
Net Monthly {Profit / Loss}*	*$14,955.63*	.....	.....	*$72,855.00*	.....
Profit and Loss General	.....	*$14,955.63*	.....	*72,855.00*	.....

Form 1. (b) Profit and Loss

COMMERCIAL EXPENSE — Month of January, 31 days, 1917

Analysis	Month of Jan. 1917	From Last Month		Eight Months To Date	To Date Same Period Last Year
		Increase	Decrease		
GENERAL COMMERCIAL EXPENSE:					
Salaries—Officers	$3,083.30	.....	.....	$20,666.40	.....
Salaries—Clerical	2,825 00	$150.00	.....	17,250.00	.....
Labor—General	525.00	75.30	.....	3,848.63	.....
Telegraph and Telephone	270.50	62.25	.....	2,003.76	.....
Office Supplies	285.90	.....	$37.00	2,025.20	.....
Taxes, Corporation	.....	.....	.....	.....	.....
Legal Expenses	300.00	.....	250.00	1,935.00	.....
Patent Expenses	60.00	60.00	.....	486.49	.....
Bicycle Royalties	140.70	.....	.....	1,013.60	.....
Frt. and Express Commercial	136.75	.....	31.00	957.00	.....
Insurance on Stock	210.00	.....	.....	1,512.00	.....
Interest Paid	.....	.....	.....	.....	.....
Discount Allowed	762.00	115.56	.....	4,590.56	.....
Rent	75.00	.....	.....	600.00	.....
Commercial Reserves	853.34	.....	.....	4,462.00	.....
Expenses Unclassified	178.66	.....	81.18	2,825.82	.....
Total	*$9,706.15*	*$463.11*	*$399.18*	*$64,176.46*	.....
	Net	*63.93*	.....	.....	.....
SELLING EXPENSE:					
Salaries—Salesmen	$1,250.00	$300.00	.....	$7,500.00	.....
Labor—General	350.00	.....	.....	2,800.00	.....
Commission on Sales	1,478.60	500.00	.....	7,647.80	.....
Traveling	903.50	210.00	.....	6,698.00	.....
Entertainment	110.70	.....	.....	797.60	.....
Rebates and Allowances	578.00	61.50	.....	4,217.50	.....
Shows and Demonstrations	.....	.....	.....	.....	.....
Postage	379.40	.....	$88.39	2,652.81	.....
Office Supplies	275.00	30.00	.....	2,207.00	.....
Adv. Periodicals	2,168.90	100.00	.....	15,297.20	.....
Adv. Circulars	2,000.80	33.08	.....	10,200.10	.....
Adv. Catalogues	.....	.....	.....	.....	.....
Selling Expense Unclassified	309.00	47.38	.....	2,262.38	.....
Total	*$9,803.10*	*$1,281.96*	*$88.39*	*$63,280.89*	.....
	Net	*1,193.57*	.....	.....	.....
Grand Total Commercial Exp.	*$19,509.25*	*$1,745.07*	*$487.57*	*$128,456.85*	.....
	Net	*1,257.50*	.....	.....	.....
CREDIT:					
Interest Received	$650.00	$85.00	.....	$4,285.00	.....
Cash Discount Earned	1,500.00	360.00	.....	9,360.00	.....
Credits Unclassified	73.95	.....	$40.00	551.60	.....
Total	*$2,223.95*	*$445.00*	*$40.00*	*$14,196.60*	.....
	Net	*405.00*	.....	.....	.....
Net Commercial Expense	*$17,285.30*	*$853.50*	.....	*$113,260.25*	.....
Sales for Month	*$118,794.00*	*$18,745.14*	.....	*$785,884.75*	.....
Com. Percentage for Month	*12.1%*	.....	*4.9%*	.....	.....
Sales Percentage for month*	6.9%	.....	.....	.....	.....

*Ratio between Selling Expense and Total Sales for the month.

Form 1. (c) Commercial Expense

FACTORY OVERHEAD — Month of January, 31 days, 1917

Analysis	Month of Jan. 1917	From Last Month		Eight Months To Date	To Date Same Period Last Year
		Increase	Decrease		
NON-PRODUCTIVE LABOR:					
Foremen	$1,515.45	$100.00	.....	$11,200.00	.....
Clerks	950.64	50.00	.....	5,900.00	.....
Manufacturing	4,840.35	1,460.00	.....	40,277.06	.....
General	.....	.....	.....	.....	.....
Total	*$7,306.44*	*$1,610.00*	.....	*$57,377.06*	.....
NON-PRODUCTIVE MATERIAL:					
Shipping Supplies	$1,560.75	$175.80	.....	$9,875.62	.....
Operating Supplies	470.20	90.00	.....	3,369.21	.....
Miscellaneous Equipment	915.00	116.05	.....	6,211.85	.....
Fuels	1,172.65	110.00	.....	10,239.20	.....
General	.....	.....	.....	.....	.....
Total	*$4,118.60*	*$491.85*	.....	*$29,695.88*	.....
NON-PRODUCTIVE EXPENSE:					
Monthly Depreciation	$2,139.32	.....	.....	$23,942.08	.....
Monthly Insurance	798.00	.....	.....	5,598.20	.....
Monthly Taxes	70.00	.....	.....	560.00	.....
Monthly Rent	.....	.....	.....	.....	.....
Frt. and Express Mfg.	1,896.06	$165.00	.....	12,260.28	.....
Current for Lighting	250.00	28.95	.....	1,625.90	.....
Gas for Lighting	165.00	18.75	.....	815.25	.....
	35.40	.....	.....	212.55	.....
Overhead Unclassified	.....	.....	.....	.....	.....
Total	*$4,118.60*	*$491.85*	.....	*$29,695.88*	.....
Grand Total Overhead	*$16,778.82*	*$2,314.55*	.....	*$132,087.20*	.....
Overhead Used @ 80%	*$16,722.00*	.....	.....	*$126,406.95*	.....
Overhead {Unused / Excess} *	*56.82*	.....	*$259.85*	*5,680.25*	.....
Productive Labor for Month	*$20,902.50*	*$3,218.00*	.....	.....	.....
Overhead Percentage for month	*80.27%*	.....	*1.58%*	.....	.....

Form 1. (d) Factory Overhead

FACTORY PRODUCTION Month of January, 31 days, 1917

Analysis	Month of Jan. 1917	From Last Month: Increase	From Last Month: Decrease	Eight Months To Date	To Date Same Period Last Year
PRODUCTION:					
Productive Labor....	$20,902.50	$3,216.00	.....	118,564.96	.....
Overhead Used @ 80%	16,722.00	2,574.40	.....	118,564.96	.....
General Stores.....	45,954.22	.....	$290.00	220,199.89	.....
Semi-Finished Stores.	27,221.85	.....	6,441.77	89,273.12	.....
Total Monthly Production	*$110,800.57*	*$5,792.40*	*$6,731.77*	*$576,248.09*	.....
	Net	.....	*939.37*	.....	.....
Plus Previous Work in Progress.....	$64,280.70	.....	.....	.....	.....
Total Work in Progress	*$175,081.27*	.....	.....	.....	.....
FINISHED PRODUCTION:					
Charged to Semi-Finished Stores.....	$21,200.60	.....	$16,345.98	.....	.....
Charged to Finished Stores	101,284.62	$27,091.26	.....	.....	.....
Charged to Betterments	5,442.90	5,442.90	.....	$22,780.00	.....
Total Production Finished	*$127,928.12*	*$32,534.16*	*$16,345.98*	.....	.....
	Net	*16,188.18*	.....	.....	.....
Net Work in Progress	*$47,153.15*	.....	*$17,127.55*		
DEPRECIATION REPAIRS:					
Labor	$815.30	$277.05	.....	$5,890.25	.....
Material	327.80	.....	$17.20	1,951.74	.....
Total	*$1,143.10*	*$277.05*	*$17.20*	*$7,841.99*	.....
	Net	*259.85*	.....	.....	.....
CHARGED TO RESERVES:					
Reserve for Real Estate	.....	.....	.....	.....	.....
Reserve for Buildings	$70.00	.....	.....	$426.35	.....
Reserve for Building Equipment	110.00	$60.00	.....	625.40	.....
Reserve for Office, Fur. & Equipment	49.70	10.00	.....	211.11	.....
Reserve for Machy. & Tools.....	683.00	210.00	.....	4,716.18	.....
Reserve for Dies & Jigs	71.10	.....	$25.00	760.80	.....
Reserve for Shop Fix. & Fittings....	80.00	15.60	.....	565.65	.....
Reserve for Patterns.	50.00	.....	10.75	360.70	.....
Reserve for Drawings	29.30	.....	.....	175.80	.....
Total	*$1,143.10*	*$295.60*	*$35.75*	*$7,841.99*	.....
	Net	*259.85*	.....	.....	.....
Total Reserve Charge.	*$1,143.10*	.....	.....	.....	.....

*Difference between Work in Progress $47,153.15 and Previous Work in Progress $64,280.70.

Form 1. (e) Factory Production

GENERAL MANAGER'S

SALES

ITEMS	QUANTITY		VALUE			
MOTORCYCLES	TO-DAY	CUM.	TO-DAY		CUM.	
OLD MODELS						
NEW "						
TOTAL						
BICYCLES						
RACER						
ROAD RACERS						
ROADSTER						
LADIES						
SPECIAL						
JOB						
TOTAL						
PARTS ORDERED						
REPAIRS						
GRAND TOTAL						

SHIPMENTS

ITEMS	QUANTITY		VALUE			
MOTORCYCLES						
OLD MODELS						
NEW "						
TOTAL						
BICYCLES						
RACER						
ROAD RACERS						
ROADSTER						
LADIES						
SPECIAL						
JOB						
TOTAL						
PARTS ORDERED						
REPAIRS						
GRAND TOTAL						

Form 2. General

DAILY REPORT

DATE _____

FINANCES		
ITEMS	REGULAR	TRUST FUNDS
BANK BALANCE		
DEPOSITS		
TOTAL		
WITHDRAWALS		
BALANCE TO-DAY		
GRAND TOTAL		
ACCOUNTS RECEIVABLE		
NOTES "		
TOTAL		
ACCOUNTS PAYABLE		
NOTES "		
TOTAL		
DIFFERENCE		

NEW AGENCIES		
	TO-DAY	CUMULATE
BICYCLES		
MOTORCYCLES		
TOTAL		

NO. OF EMPLOYES			
	HIRED	DISCHARGED	ON PAY ROLL
OFFICE			
FACTORY N.P.			
" PROD.			
TOTAL			

REMARKS:

Size of Complete Form 8½ × 9½ Inches

Manager's Daily Report

FORMS

PURCHASING AND RECEIVING

(Forms referred to in Chapter III)

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

PURCHASE REQUISITION

NO. 1288

TO THE PURCHASING AGENT _____ DATE _____ DEPT. NO. _____

FOR P. O. NO. _____ B. O. NO. _____ R. O. NO. _____ REQ. NO. _____

KINDLY ORDER GOODS LISTED BELOW WITH SHIPMENTS SO AS TO BE RECEIVED IN _____ AS FOLLOWS: PUR. ORDER NO. _____

CONTRACT DELIVERY DATE				
QUANTITY				

NOTE: IN MAKING OUT THIS REQUISITION, NEVER PUT ITEMS BOUGHT FROM DIFFERENT CONCERNS ON THE SAME SHEET. IF IN DOUBT, MAKE OUT SEPARATE REQUISITION.

FROM _____

DATE _____

QUANTITY WANTED	QUANTITY ON HAND	QUANTITY ON ORDER	QUANTITY TO BUY	DESCRIPTION OF ITEM OR SYMBOL	DATE OF DELIVERY REQUIRED	CAT. NO. AND SIZE	LAST PRICE

Size of form 6 × 8 inches
Original white, Duplicate yellow, Triplicate pink.

ORIGINAL

NOTICE: EVERY REQUISITION, NO MATTER BY WHOM MADE OUT, MUST BE CHECKED BY THE STORES RECORDER, AS TO QUANTITY ON HAND, ON ORDER, ETC., BEFORE PURCHASE IS MADE.

APPROVED _____

CHECKED BY _____
STORES RECORDER

(SAME NOTICE AS ABOVE) DUPLICATE

APPROVED _____

CHECKED BY _____

THIS COPY FOR PURCHASING AGENT — STORES RECORDER

(SAME NOTICE AS ABOVE) TRIPLICATE

APPROVED _____

CHECKED BY _____

THIS COPY TO BE RETAINED BY STORES RECORDER UNTIL GOODS RECEIVED — STORES RECORDER

Form 3. Purchase Requisition

ROGERS MOTOR WORKS PURCHASE ORDER P-NO.

BRIDGEPORT, CONN.

The above no must be on every invoice and package

MESSRS.

DATE

STORES REQ. NO.

Please ship for our account to the above address F. O. B. the following goods which we purchase in accordance with the terms, prices, delivery and specifications given below: Ship via.

QUANTITY	DESCRIPTION OF GOODS	DATE OF DELIVERY REQUIRED	DISCOUNT	NET PRICE	
	Size of Form 8½ × 10½ inches. Original white, Duplicate yellow, Triplicate pink & Quadruplicate blue.				

ORIGINAL

NOTICE All goods are held subject to your order until we receive an invoice. No allowance will be made for Boxing or Cartage.

BY_____ PLANT PURCHASING AGENT.

IMPORTANT *Acknowledge receipt of order and if any items backordered advise by return mail.*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

NOTICE THIS COPY TO BE ALWAYS KEPT IN PURCHASING FILE.

DUPLICATE

BY_____ PLANT PURCHASING AGENT.

APPROVED_____ WORKS MANAGER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

NOTICE This Copy for Stores Recorder to be held by him until all checking is done and then sent to accounting department.

TRIPLICATE

BY_____ PLANT PURCHASING AGENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

NOTICE THIS COPY FOR RECEIVING CLERK. QUANTITY AND PRICE MUST NOT BE SHOWN

QUADRUPLICATE

BY_____ PLANT PURCHASING AGENT.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Form 4. Purchase Order

TICKLER CARD

Wanted by Mr. _____ Date _____ 19

Subject

File Nos.

Size of form 3 × 5 inches
Printed on Manilla Card.

Form 5. Purchase Order Tickler Card

MATERIAL RECEIPT AND NOTICE

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

STOREKEEPER AND PURCHASING AGENT _____ DATE _____

WE HAVE RECEIVED FROM _____

VIA _____ { PRT. EXP. BILL NO. _____

THE FOLLOWING MATERIAL _____ TRANSPORTATION CHARGES

ON ACCOUNT OF OUR PURCHASE ORDER NO. _____ AND PURCHASE REQN. NO. _____

QUANTITY			NAME OF MATERIAL	WEIGHT OR SIZE	REMARKS
Cases	Kegs Bbls.	Measure			

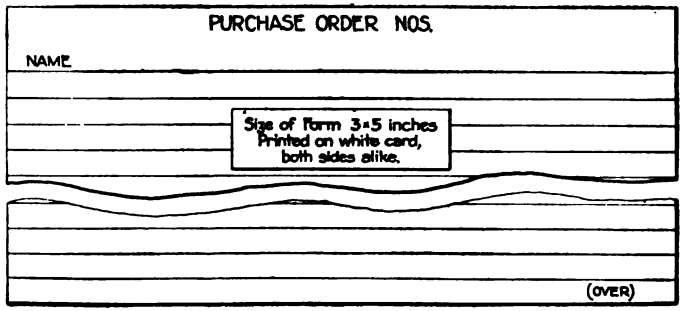
Size of form 6 × 8½ inches
Original white, Duplicate yellow, Triplicate pink and Quadruplicate blue paper. The last line on form should read, on Duplicate: "This copy for Purchasing Agent." On Triplicate: "This copy for Stores Recorder." On Quadruplicate: "This copy held by Stores Keeper."

NOTE: IN EVERY INSTANCE GOODS MUST BE COUNTED, WEIGHED OR MEASURED BEFORE LISTING ABOVE. NEVER PUT ITEMS FROM TWO PURCHASE ORDERS ON ONE RECEIVING TICKET

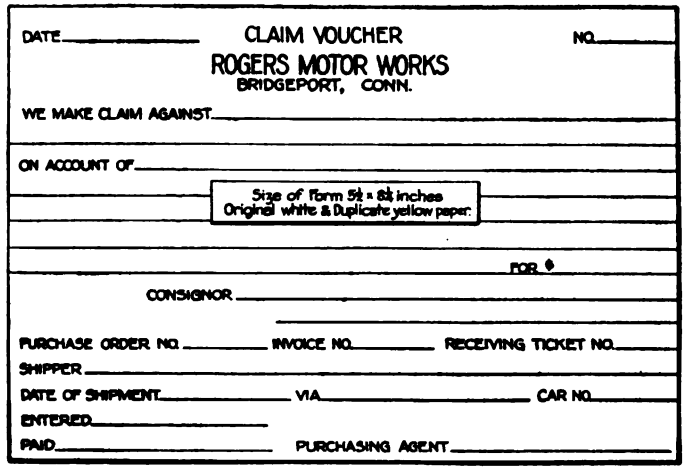
RECEIVING CLERK

THIS COPY HELD BY RECEIVING CLERK

Form 6. Material Receipt and Notice



Form 7. Purchase Order Numbers



Form 8. Claim Voucher

FORMS

GENERAL STORES

(Forms referred to in Chapter IV)

FORM NO. _____

GENERAL STORES RECORD

SYMBOL _____

BALANCE ON HAND MUST BE SHOWN AT TIME EACH ENTRY IS MADE. POST ONLY AFTER ACTUAL RECEIPT, DELIVERY OR RESERVATION.

NAME & DESCRIPTION _____ UNIT OF MEASURE _____

LOCATION: BUILDING NO. _____ FLOOR NO. _____ AISLE NO. _____ BIN NO. _____

When balance on hand, less reservation, is under _____ Order _____

ORDERED			RECEIVED			RESERVED			ISSUED				BALANCES					
Date	Pur. Order No.	Quantity	Date	Pur. Order No.	Quantity	Date	For	Quantity	Date	Req. No.	Quantity	Unit Price	On Order	In Reserve	Available	On Hand In Stock	Value on Hand	

Size of form 10½ x 12 inches

Form 9. General Stores Record

GENERAL STORES REQUISITION

A B C D E F G ORDER NO.

THIS SPACE FOR STORES KEEPER ONLY

YEAR	MO.	DAY	QUANTITY	UNIT	PRICE	AMOUNT

SYMBOL

LOCATION

BLDG.	FLOOR	AISLE	BIN

STOCK BALANCE

QUANTITY	ARTICLE

Size of form 4×6 inches. Original white, Duplicate yellow.

DELIVER TO DEPT. BEFORE (Sig.)

RECEIVED THE ABOVE (Sig.)

CHARGED IN STORES DEPT.	CHARGED IN COST DEPT.

Form 10. General Stores Requisition

STORES CREDIT MEMORANDUM

A B C D E F G ORDER NO.

THIS SPACE FOR STORES KEEPER ONLY

YEAR	MO.	DAY	QUANTITY	UNIT	PRICE	AMOUNT

SYMBOL

LOCATION

BLDG.	FLOOR	AISLE	BIN

QUANTITY	ARTICLE

Size of form 4×6 inches. Original white, Duplicate yellow.

OBTAIN FROM DEPT. BEFORE (Sig.)

RECEIVED THE ABOVE (Sig.)

CREDITED IN STORES DEPT.	CREDITED IN COST DEPT.

Form 11. Stores Credit Memorandum

SHOP STORES REQUISITION

TO BE PRESENTED TO SUB-STORES KEEPER. IF ITEM IS NOT ON HAND FORWARD TO STORES RECORDER.

CHARGE TO

ORDER NO.

DELIVER TO

ON

Size of Form 4 × 6 inches
Original white, Duplicate yellow

IN CHARGE

PUT ONLY ONE ITEM ON THIS TICKET

QUANTITY DELIVERED

RECEIVED THE ABOVE

TAG

Form 12. Shop Stores Requisition

FORMS

COMPONENT AND FINISHED STORES

(Forms referred to in Chapter V)

FORM NO. _____

COMPONENT STORES RECORD

SYMBOL _____

BALANCE ON HAND MUST BE SHOWN AT TIME EACH ENTRY IS MADE. POST ONLY AFTER ACTUAL RECEIPT, DELIVERY OR RESERVATION.

NAME & DESCRIPTION _____ UNIT OF MEASURE _____

LOCATION: BUILDING NO. _____ FLOOR NO. _____ AISLE NO. _____ BIN NO. _____

When balance on hand, less reservation, is under _____ Notify Planning dep't _____

RECEIVED					RESERVED			ISSUED				BALANCES			
Date	From Order No.	Un-finished Orders	Total Cost	Quantity on Finished Orders	Date	For	Quantity	Date	To Whom	Quantity	Unit Price	Reserved	On Hand Unfinished Orders	On Hand Component Stores	Value on Hand

Size of form: 10½ × 12 inches

Form 13. Component Stores Record

FORM NO. _____

FINISHED STORES RECORD

SYMBOL _____

BALANCE ON HAND MUST BE SHOWN AT TIME EACH ENTRY IS MADE. POST ONLY AFTER ACTUAL RECEIPT, DELIVERY OR RESERVATION.

NAME & DESCRIPTION _____ UNIT OF MEASURE _____

LOCATION: BUILDING NO. _____ FLOOR NO. _____ AISLE NO. _____ BIN NO. _____

When balance on hand, less reservation, is under _____ Notify Works Manager: _____

RECEIVED					RESERVED			ISSUED				BALANCES				
Date	From Order No.	Unfinished Orders	Total Cost	Quantity on Finished Orders	Date	For	Quantity	Date	To Whom	Quantity	Unit Price	Reserved	On Hand Unfinished Orders	On Hand Finished Stores	Value on Hand	

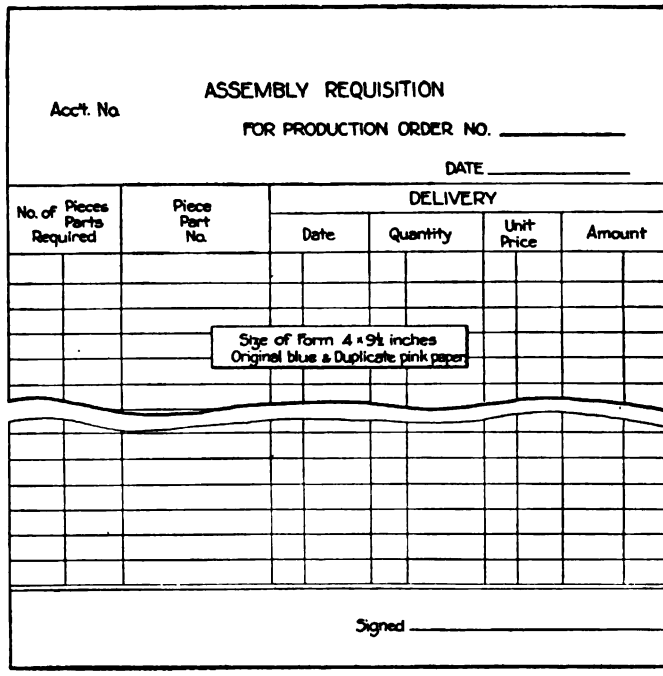
Size of form 10¾ × 12 inches

Form 14. Finished Stores Record

FORMS

STORES—SPECIAL FORMS

(Forms referred to in Chapter VI)



Form 15. Assembly Requisition

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

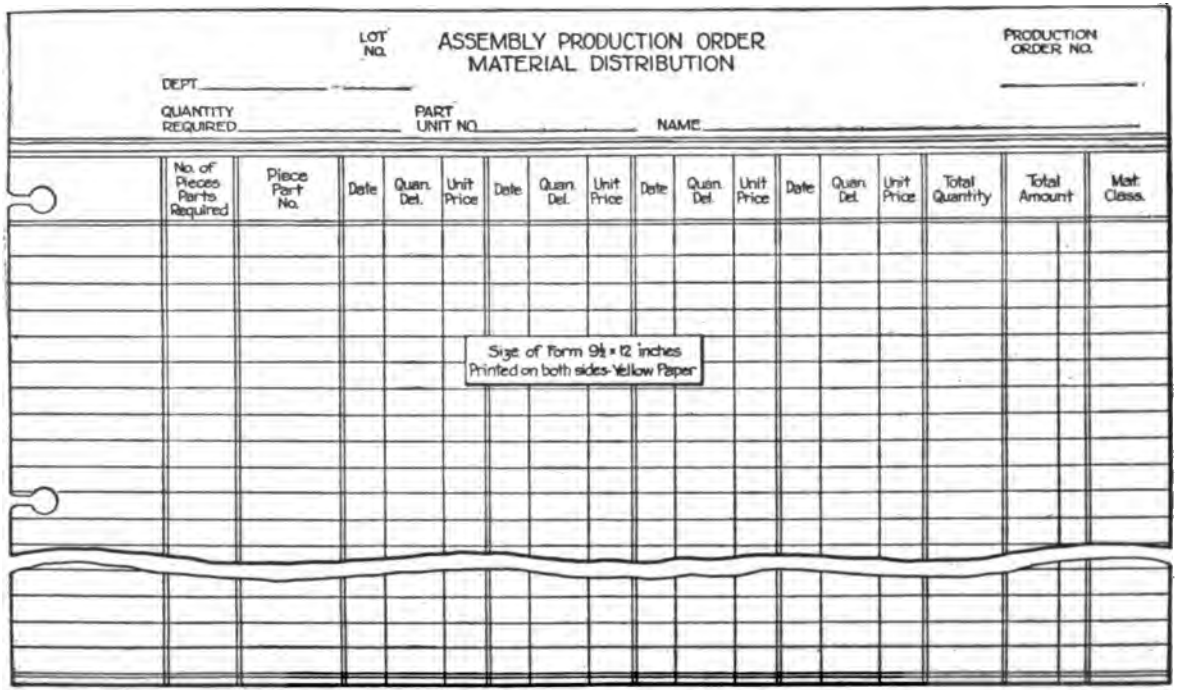
PRODUCTION ORDER DISTRIBUTION OF MATERIAL

QUANTITY REQUIRED _____ PIECE / UNIT / PART NO. _____ PROD. ORDER _____

General Semi-Finished Stores						General Semi-Finished Stores					
Kind of Material						Kind of Material					
Amount Required						Amount Required					
Date	Req. No.	Quantity Issued	Cumulative Quantity	Unit Price	Amount	Date	Req. No.	Quantity Issued	Cumulative Quantity	Unit Price	Amount

Size of Form 9½×12 inches
Printed on both sides-Yellow Paper

Form 16. Production Order Distribution of Material



Form 17. Assembly Production Order Material Distribution

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

Nº 639

Date _____ STORE CLERK'S ORDER

To the Superintendent: Please order made the following articles called for on Shipping Order No. _____

For Stock, Maximum _____ On Hand _____ Minimum _____

QUANTITY	ARTICLE

Size of Form 5½×8¼ inches. Original blue, Duplicate pink.

Chief Stores Clerk

Form 18. Stores Clerk's Order

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

GOODS RETURNED TO US
MEMORANDUM

WE HAVE RECEIVED THE FOLLOWING, RETURNED FROM _____

DATE SHIPPED	DATE RETURNED	SHIPPED ON ORDER NO.	DESCRIPTION	PRIME COST AND HANDLING	RETURN VALUE	LOSS

Size of Form 6×8¼ inches Original white, Duplicate pink and Triplicate blue paper.

RECEIVING CLERK

CREDIT MESSRS.

FOLIO ADDRESS

CHARGE LOSS TO

SIGNED

Form 19. Goods Returned to Us Memorandum

FORMS

PREPARATION FOR PRODUCTION

(Forms referred to in Chapter VII)

SYMBOL_____ NO. OF CARDS____
ITEM_____
SIZE LOT_____
FILLED OUT BY_____

ENGINEERING DIVISION
PIECE KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

DATE_____ CARD NO.____
SUPERSEDES_____
SUPERSEDED BY_____
APPROVED BY_____

DRAWING ISSUE NO._____ PATT. NO._____
KIND OF MATERIAL USED_____
CUT FROM STOCK DIMENSION_____
USE WASTE CUTS FOR COMPONENT NO._____
AMOUNT OF MATERIAL FOR ____ COMPONENTS ____ LBS.____
WEIGHT ROUGH_____ FINISHED_____ SCRAP_____
MILL LENGTH_____ CUT UP LENGTHS_____

USED ON SUB-ASSEMBLY		USED ON FINAL ASSEMBLY		TOTAL USED ON UNITS	
QUANTITY	PART	QUANTITY	PIECES	QUANTITY	UNIT

OPER. MARK	DESCRIPTION OF OPERATION	DONE IN DEPT.	SET-UP NO.	MACHINE USED	NO. OF MACH'S.

Size of form 5×8 inches
Ruled on both sides

Form 20. Piece Key Card

SYMBOL _____ NO. OF CARDS ____
ITEM _____
DRAWING ISSUE NO. _____
FILLED OUT BY _____

ENGINEERING DIVISION
PART KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

DATE _____ CARD NO. ____
SUPERSEDES _____
SUPERSEDED BY _____
APPROVED BY _____

FOR UNIT NO.												DATE _____
NO. PARTS REQUIRED												SIZE LOT _____

ASSEMBLY OF PART

OPERATION MARK	ROTATION OF ASSEMBLY AND DESCRIPTION OF OPERATION	DONE IN DEPT.	PIECE NUMBERS	NO. REQ.	LOCAT'N OF STORES	NAME OF PIECE

Size of Form 5 × 8 inches
Ruled on both sides

Form 21. Part Key Card

SYMBOL _____ NO. OF CARDS ____
ITEM _____
DRAWING ISSUE NO. _____
FILLED OUT BY _____

ENGINEERING DIVISION

UNIT KEY CARD

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

DATE _____ CARD NO. ____
SUPERSEDES _____
SUPERSEDED BY _____
APPROVED BY _____

ASSEMBLY OF UNIT

OPER. NO.	DESCRIPTION OF OPERATION	DONE IN DEP'T.	NO. OF PIECE OR SUB-ASSEMBLY	NO. REQ.	LOCATION OF STORES	NAME OF PIECE SUB-ASSEMBLY

Size of Form 5×8 inches
Ruled on both sides

Form 22. Unit Key Card

DRAWING AND TRACING CARD

DRAWING NO._____

CARD NO._____ NEGATIVE NO._____

TITLE_____

PIECE NO. PART NO. UNIT NO. MODEL NO.

	MADE BY	DATE M	D	Y	TIME H	M	MIL	COST LABOR	OVERHEAD	TOTAL	DISPOSITION FILE NO	OTHERWISE
PENCIL SKETCH												
FIRST COST												
ALTERATIONS												
TOTAL												
TRACING												
FIRST COST												
ALTERATIONS												
TOTAL												
INK SKETCH												
FIRST COST												
ALTERATIONS												
TOTAL												

Size of Form 4×6 inches

CHARGED TO (OVER)

REMARKS:

PENCIL SKETCH

YEAR	VALUE	YEAR	VALUE	YEAR	VALUE	YEAR	VALUE	YEAR	VALUE

TRACING

This the reverse side of the above.

INK SKETCH

Form 23. Drawing and Tracing Card

PATTERN RECORD CARD

CARD NO._____ PATTERN NO._____

NAME & DESCRIPTION

MADE FOR PIECE NO. PARTS NO. UNIT MODEL NO.

PATTERN DATA		COSTS			CHARGED TO
DATE MADE		COST OF MATERIAL			PRO. ORDER NO.
BETTERMENT ORDER NO.		COST OF LABOR			SALES ORDER NO.
DRAWING NO.		COST OF TOOL TIME			JOB NO.
FLASK NO.		OVERHEAD			INVEN. ACCT. NO.
FLASK SIZE		TOTAL COST			
FOLLOW BOARD		MADE BY			
KIND OF MATERIAL		BOUGHT FROM			
NO. OF PIECES		LOFT NO.	AISLE NO.		SHELF NO.

Size of Form 4×6 inches

Form 24. Pattern Record Card

PATTERN LOCATION CARD

PATTERN NO._____

DATE	LOCATION	DATE	LOCATION	DATE	LOCATION

Size of Form 4×6 inches

Form 25. Pattern Location Card

FORMS

MACHINE AND TOOL STUDIES

(Forms referred to in Chapter VIII)

Speed of Countershaft _____
Steps on C.S. Cone _____
" " Mach. Cone _____
Mandril Speeds _____
Lubricating system _____
Width of Belt _____
Center-length of Belt _____

ENGINEERING DIVISION
MACHINE STUDY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
Date _____ Card No. ____
LOCATION

BUILDING	SECTION	AISLE	DEPT.

Mach. No. _____
Symbol _____
Mfg'd. by _____
Type _____
Size _____
Bought from _____
Date Purchased _____

COMPONENT SYMBOL	OPERATION NO.	OPERATION NAME	CAPACITY		TOOL SET-UP NO.	FIXTURE NO.	SPEED	FEET	CUT	LUBRICANT	NO. MACHS. TO OPERATOR
			Hourly	Daily							

Size of form 8½ x 11 inches
Ruled on both sides.

Form 26. Machine Study Card

COMPONENT NO._____
OPERATION_____
_____
DRAWING NO._____
ISSUE NO._____

ENGINEERING DIVISION
TOOL KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
DATE_____

SYMBOL_____
FOR SET-UP NO._____
_____
ITEM

DATA

MACHINE TO BE USED ON_____
COMPONENT TO BE USED ON_____
MATERIAL TO BE PROCESSED_____
AVG. NO. PIECES TOOL WILL MAKE_____
AVG. NO. PIECES TO ONE GRIND_____
AVG. NO. OF GRINDS_____
PIECES PER HOUR FROM TOOL_____
SALVAGED TO_____
SALVAGED FROM_____

SURFACE SPEED_____
MAX. DEPTH OF CUT_____
MAX. WIDTH OF CUT_____
LENGTH OF CUT_____
FEED_____
LUBRICANT_____
REMARKS_____
_____
_____

SUPERSEDES_____ SUPERSEDED BY_____ APPROVED_____

Size of form 4×6 inches

Form 27. Tool Key Card

COMPONENT NO._____
OPERATION_____
_____
DRAWING NO._____
ISSUE NO._____

ENGINEERING DIVISION
TOOL SET-UP KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
DATE_____

SET-UP NO._____
_____
KIND OF MACHINE USED

SURFACE FEET PER MINUTE			PIECES COMPLETED		
STOCK	THREAD	DRILL	PER HOUR	PER 8 HOURS	

SYMBOL	DRAWING ISSUE	NAME OF TOOL	QUANTITY	NO. PIECES PER GRIND	NO. GRINDS PER TOOL	AVG. PIECES PER TOOL

Size of form 4×6 inches

SUPERSEDES_____ SUPERSEDED BY_____ APPROVED_____

Form 28. Tool Set-Up Key Card

COMPONENT NO._____
OPERATION_____
DRAWING NO._____
ISSUE NO._____

ENGINEERING DIVISION
FIXTURE & DIE KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
DATE_____

SYMBOL_____
FOR SET-UP NO._____
ITEM

PATTERN NO.	FLASK NO.	KIND OF MACHINE USED ON	PIECES PER HR.	SALVAGED FROM	SALVAGED TO

GENERAL DESCRIPTION _____

Size of Form 4 × 6 inches

SUPERSEDES_____ SUPERSEDED BY_____ APPROVED_____

Form 29. Fixture and Die Key Card

ROGERS MOTOR WORKS OPERATION STUDY CARD
BRIDGEPORT, CONN.

Study No. Superseded by Supersedes

Description of Operation

No. Done in Dept. On Mach. No.

Material Processed Grade

Condition (hardened, annealed, heat treated, etc.)

Preliminary Operations

C Mn Si S P TS El Scleroscope Brinell

Tool No. Description

Cutter dia. No. of teeth Kind of steel

R.P.M. Cutting speed Feet per min. Depth of Cut Ins.

Feed Inches per min. Per rev. Per tooth

Kind of Lubricant Gallons per min.

Time cutter should run between sharpenings Hours minutes

Heat treatment to be given cutter

No. pcs. in test lot No. of pieces in fixture (each batch)

Work begun o'clock. Finished o'clock Total

Total elapsed time minutes. Time out for permissible delays including setting-up and stripping machine, changing cutters and for requirements of operator's personal comfort minutes.

Total actual working time minutes. Average per unit min.

No. Pcs. accepted Inspector's Signature

Operator's Name No. Rate

Classification Approx. Age yrs. Wt. Lbs.

Mental Alertness (Remarks)

Physical Activity (Remarks)

Observer's Name

SKETCH
Show light outline of blank, and heavy outline of finished job.

Piece No.

Piece Name

DATE

STD. ALLOWANCES
Set up machine Hrs.
Strip " "
Change cutters " "
Time per piece "
Operator is to handle machs.

Size of Form 8½ × 11 inches

OPERATION OF OPERATION		TOOLS AND FIXTURES	
Symbol	No.	Set-up No.	Description

Form 30. Operation Study Card

Study No. 4
Superseding No. 3
Superseded by No. _____
Piece Name Ball Piece
Mach. No. 122 Dept. No. Machine

MOTION STUDY CARD

Date 8/28/16 Operation Name Finish
Operator's No. 6 Name Stiggles

Piece No. PP½ B1
Operation No. C
From Operation Study No. 1
72 Pieces per lot

ROT. NO.	DESCRIPTION OF ROTATION	SPEED	FEED	JIGS REQ.	SETTING UP	TAKING DOWN	1	2	3	4	AVER. TIME	PIECES MADE	TIME ALLOWANCE SET	HIGH RATE	LOW RATE	REMARKS
1	Setting Up Tools		*				169.7	149.1	142.3	160.2	155.3	1080	.805			
2	Time Stamping		**				–	–	–	–	37.9	72	.020			
3	Putting Casting on		†				2.0	2.2	1.9	2.0	2.0	1	.067			
4	Roughing Ball	1½ R	†				7.9	8.2	8.7	8.7	8.4	1	.280			
5	Finishing Shoulder	1½ R	†				5.2	5.1	4.5	4.8	4.9	1	.163			
6	Finishing Ball	1½ R	†				3.1	3.3	3.0	3.1	3.1	1	.103			
7	Taking Casting off		†				2.4	2.4	3.0	2.4	2.6	1	.087			
8	Replacing Tool, Cut Roughing		*				79.0	65.2	58.4	64.7	67.8	288	.009			
9	Shoulder "		*				74.8	70.4	66.7	59.7	67.5	804	.005			
10	Shoulder Finishing		*				38.3	43.8	43.3	38.4	41.0	288	.008			
11	Ball Finishing		*				50.0	48.0	53.2	55.9	51.8	216	.009			
12	Taking down Tools		*				77.8	70.9	82.5	68.1	74.8	1080	.003			
											Total		.756			
	Size of Form 8½ × 11 inches							Standard Time per 100					.76			
							Seconds	Seconds	Seconds	Seconds	Seconds		Min. per 100 Pcs.			

* Taken from Time Study PP1 B1 C1
** Average of Times on Time Studies PP1 B1 C1, PP1½ B1 C3, PP1½ B1 C1
† Taken from Time Study PP1½ B1 C8

Form 31. Motion Study Card

MOTION STUDY

TIME STUDY No. 4 — Date, August 28, 1916

Rotation	Motion	Left Hand	Right Hand
2		Stopping machine	Holding F casting
	A	F casting to rack	
	B	F rack to floor	
	C	Pick up R tag	
	D	Write F tag	
	E	Walk to clock, stamp and return	Either or both hands
	F	R tag to post	
	G	F tag to rack	
	H	R rack to shelf	
	I	Dump rack and place on shelf	
	J	Pick up R casting	Start machine
3		On shipping rod, holding R casting	On F casting on turret set screw
	A	Reverse countershaft to forward	Lock turret
	B	Start casting on arbor	To pilot
	C	To turret handle	Start turret slide forward
4		On turret handle	Feeding turret slide
	A	Tighten turret	" " "
	B	Turn on soda water and place stream	Feed tool
	C	Put F casting on rack	" "
	D	Put R casting on cap screw	" "
	E	Loosen turret	Back turret slide
	F	Lock turret	" " "

Form 32. Motion Study on Operations (continued on following page)

5		On turret	On pilot
	A	Tighten turret	Feed tool
	B	Begin cross feed and place soda water stream	" "
	C	Feed tool	Hold pilot lever
	D	Hold tool	Back turret slide (slight)
	E	Push cross feed handle down	Feed turret slide (slight)
	F	Loosen turret	
	G	Lock turret	
6		On turret	On pilot
	A	Place soda water stream	Feed tool
	B	Turn off soda water	Back turret slide
	C	To shipping rod	" " "
7		On shipping rod	Backing turret slide
	A	Reverse countershaft	" " "
	B	Apply wrench	To F casting
	C	Pick up R casting	Remove F casting from arbor
	D	To shipping rod	Put F casting on turret set screw
9		Before removing, take 4 cuts on R casting. Then set new tool tight against this surface and tighten set screws.	

STANDARD EQUIPMENT: Shelf at left containing box for R castings next to machine, and rack for F castings back of box. Monkey wrench and screw driver.

STANDARD SERVICE: All tools and work brought to machine and taken away from machine by some one other than operator. Tools always furnished ground ready for use, and operator supplied with freshly ground tools when needed.

TOOLS SUPPLIED: 1 Arbor, 2 Ball Tool Holders, 1 Shoulder Tool Holder (lever type), 1 Wrench and Wrench Block, 1 O. D. Gage, 1 Shoulder Thickness Gage.

Form 32. Motion Study on Operations (continued from preceding page)

SYMBOL _____ NO. OF CARDS ____
ITEM _____
DRAWING ISSUE NO. _____
FILLED OUT BY _____

ENGINEERING DIVISION
OPERATION KEY CARD
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

DATE _____ CARD NO. ____
SUPERSEDES _____
SUPERSEDED BY _____
APPROVED BY _____

OPERATION NO. NAME OF OPERATION NO. MACHS. OPERATED
MOVED FROM DEPT. NO. DONE IN DEPT. NO. MOVE TO DEPT NO.
MOVED FROM MACHINE DONE ON MACHINE MOVE TO MACHINE
SIZE LOT TIME ALLOWED TIME STUDY NO. WAGE RATE NO.

ROT NO.	INSTRUCTIONS	TOOLS REQUIRED	FIXTURES	SPEED	FEED	CUT	LUBRICANTS

Size of form 5×8 inches
Ruled on both sides

Form 33. Operation Key Card

LOCATION
COMPONENT

RATE MEMO

DATE_____

THE FOLLOWING RATES TAKE EFFECT TO-DAY

MODEL	COMP.	OPER.	DESCRIPTION	PRICE PER 100

MACHINE

NO. MACHINES PER OPERATOR

NO. PIECES IN FIXTURE		CUTTING TOOL	STANDARD OUTPUT PER MAN IN 8 HOURS
DEPTH OF CUT, INCHES		DIAMETER	
FEED, INCHES PER MIN.		STEEL	RECOMMENDED BY
SURFACE SPEED, FT. PER MIN.		R.P.M.	
STANDARD TIME ALLOWANCES:		LUBRICANT	_____ EXPERIMENTAL ENGINEER
TIME PER PIECE, MIN.		GALS. PER MIN.	
SET UP MACHINE, "		REMARKS:	_____ FOREMAN
STRIP " "			RATE SET BY WAGE BOARD
RUN CUTTERS, HOURS.			
CHANGE CUTTERS, MIN.			
GRIND " "			_____ PRODUCTION ENGINEER

Size of Form 4×6 inches. Original blue, Duplicate pink, Triplicate yellow paper and Quadruplicate white card.

Form 34. Rate Memo

FORMS

SCHEDULES AND CHARTS

(Forms referred to in Chapter IX)

ISSUE NO._____

MANUFACTURING ORDER

MFG. ORDER NO. _____ RATE PER DAY _____ SCHEDULE BEGINS _____

MODEL _____ NO. DAYS RUN _____ SCHEDULE ENDS _____

QUANTITY TO SCHEDULE _____

WEEK ENDING		NO. DAYS		SCHEDULE			MADE		DAYS	
MONTH	DAY	IN WEEK	CUM.	DAILY	FOR WEEK	CUM. TOTAL	FOR WEEK	CUM. TOTAL	AHEAD	BEHIND
MAY	6	6	6							
	13	6	12							
	20	6	18							
	27	6	24							
JUNE	3	5	29							
	10	6	35							
	17	6	41							
	24	6	47							
JULY	1	6	53							
	8	5	58							
	15	6	64							
	22	6	70							
	29	6	76							
AUGUST	5	6	82							
	12	6	88							
	19	6	94							
	26	6	100							
SEPTEMBER	2	6	106							
	9	5	111							
	16	6	117							
	23	6	123							
	30	6	129							
OCTOBER	7	6	135							
	14	6	141							
	21	6	147							
	28	6	153							
NOVEMBER	4	6	159							
	11	6	165							
	18	6	171							
	25	5	176							
DECEMBER	2	6	182							
	9	6	188							
	16	6	194							
	23	6	200							
	30	5	205							

Size of form - 7½ × 10 inches

Form 35. Manufacturing Order

ENGINEERING DIVISION
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
PRODUCTION SCHEDULE

NO. _____ DATE _____

SYMBOL _____ TYPE _____ COMPONENT NO. _____

TOTAL REQUIREMENTS _____
ON HAND _____ BASED ON MANUFACTURING ORDER NO. _____
ON ORDER _____ RATE PER _____ SCHEDULE BEGINS _____
BALANCE TO SCHEDULE _____ NO. DAYS RUN _____ SCHEDULE ENDS _____

TIME PERIODS				SCHEDULES									
Week Ending		No. Days		Schedule		Production Orders Issued			Made		Days	
MONTH	DATE	IN WEEK	CUM.	FOR WEEK	CUM. TOTAL	No.	DATE	QUANTITY	FOR WEEK	CUM. TOT'L	AHEAD	BEHIND
SEPTEMBER	2	2	2									
	9	5	7									
	16	6	13									
	23	6	19									
	30	6	25									
OCTOBER	7	6	31									
	14	6	37									
	21	6	43									
	14	6	267									
	21	6	273									
	28	6	279									
AUGUST	4	6	285									
	11	6	291									
	18	6	297									
	25	6	303									
SEPTEMBER	1	6	309									

Size of form - 7½ × 12 inches

Form 36. Production Schedule

ENGINEERING DIVISION
ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

PURCHASE ORDER SCHEDULE

NO._____ DATE_____

SYMBOL_____ TYPE_____ MATERIAL_____

TOTAL REQUIREMENTS_____ All purchase order schedules must provide for delivery _____ days ahead of manufacturing schedule.

ON HAND_____ BASED ON MANUFACTURING SCHEDULE NO._____

ON PURCHASE ORDER_____ RATE PER_____ SCHEDULE BEGINS_____

BALANCE TO PURCHASE_____ NO. DAYS RUN_____ SCHEDULE ENDS_____

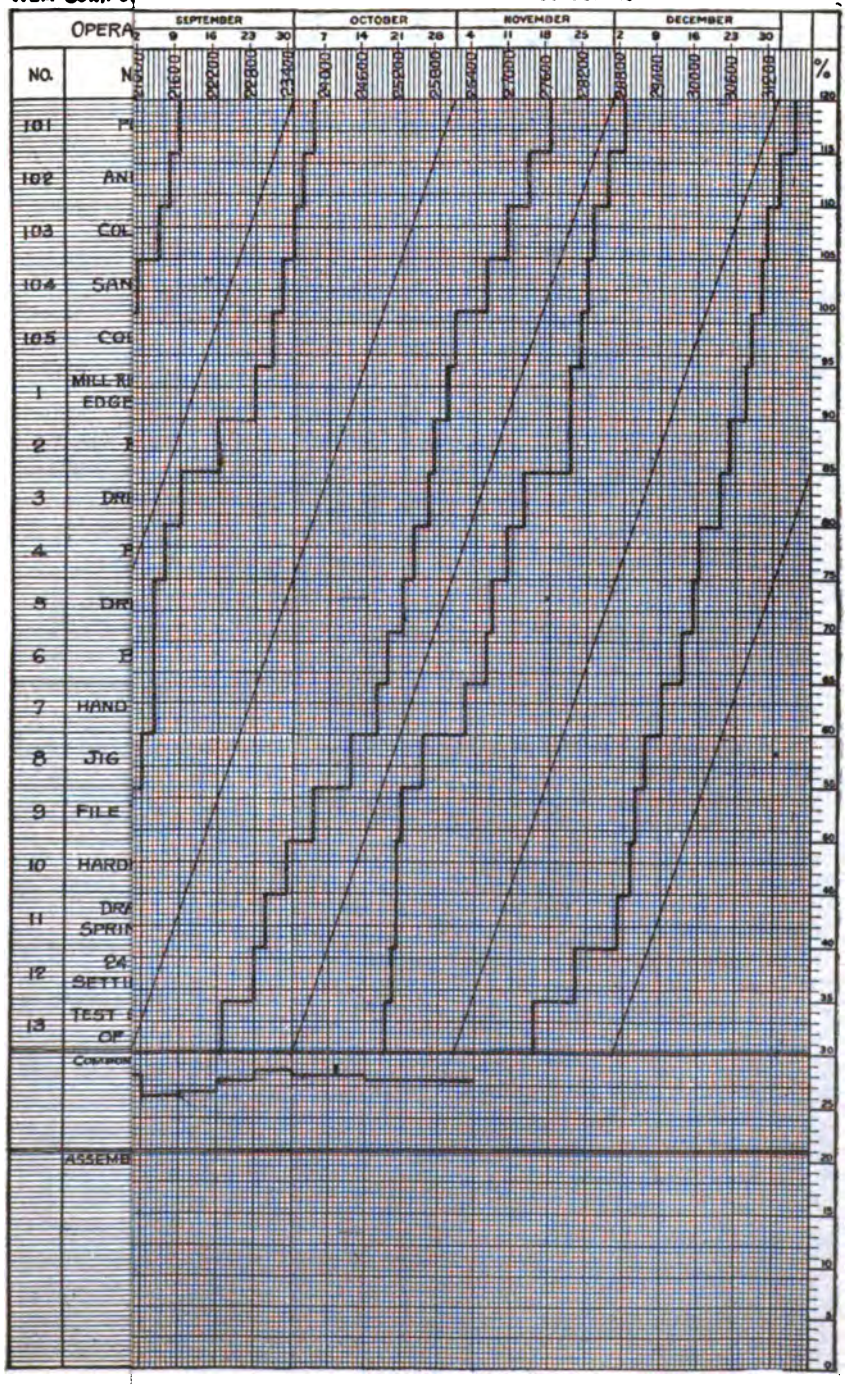
TIME PERIODS				SCHEDULES								
Week Ending		No. Days		Schedule		Purchase Orders Issued			Received		Days	
MONTH	DATE	IN WEEK	CUM.	FOR WEEK	CUM. TOTAL	NO.	DATE	QUANTITY	FOR WEEK	CUM. TOTAL	AHEAD	BEHIND
SEPTEMBER	2	2	2									
	9	5	7									
	16	6	13									
	23	6	19									
	30	6	25									
OCTOBER	7	6	31									
		6	37									
	7	6	[illegible]									
	14	6	257									
	21	6	273									
	28	6	279									
AUGUST	4	6	285									
	11	6	291									
	18	6	297									
	25	6	303									
SEPTEMBER	1	6	309									

Size of form 7½ × 12 inches

Form 37. Purchase Order Schedule

'TEM COMPO

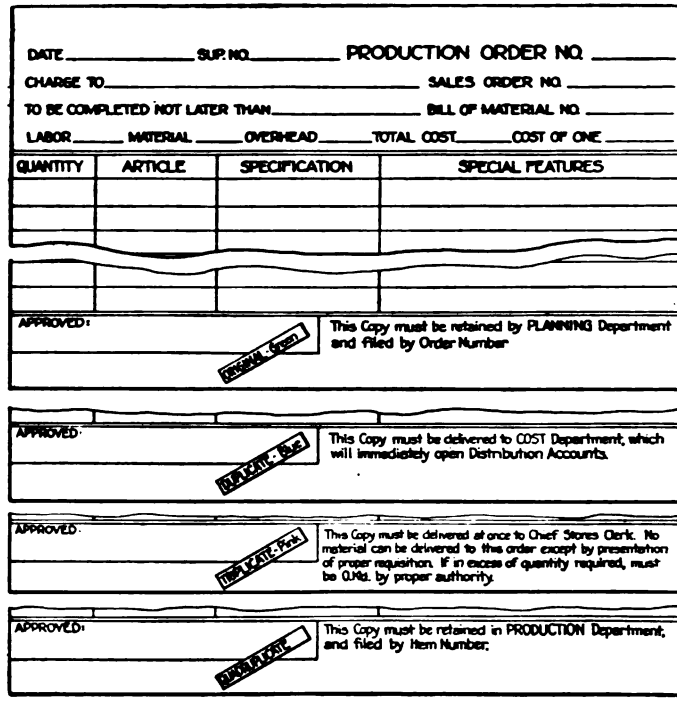
SEASON 1916



FORMS

RELATING TO PRODUCTION

(Forms referred to in Chapter X)


DATE _____ SUP. NO. _____ PRODUCTION ORDER NO. _____

CHARGE TO _____ SALES ORDER NO. _____

TO BE COMPLETED NOT LATER THAN _____ BILL OF MATERIAL NO. _____

LABOR _____ MATERIAL _____ OVERHEAD _____ TOTAL COST _____ COST OF ONE _____

QUANTITY	ARTICLE	SPECIFICATION	SPECIAL FEATURES

APPROVED:

ORIGINAL - Green

This Copy must be retained by PLANNING Department and filed by Order Number

APPROVED:

DUPLICATE - Blue

This Copy must be delivered to COST Department, which will immediately open Distribution Accounts.

APPROVED:

TRIPLICATE - Pink

This Copy must be delivered *at once* to Chief Stores Clerk. No material can be delivered to the order except by presentation of proper requisition. If in excess of quantity required, must be O.K'd. by proper authority.

APPROVED:

QUADRUPLICATE

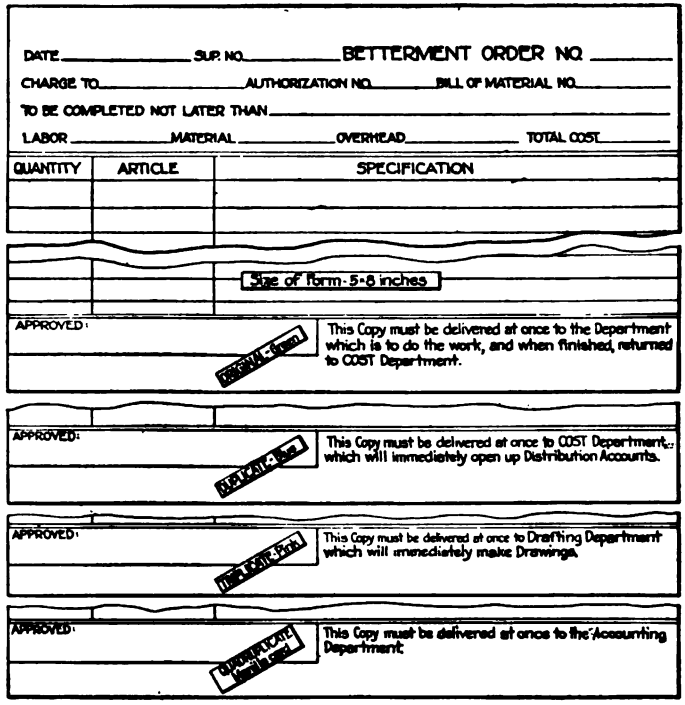
This Copy must be retained in PRODUCTION Department, and filed by Item Number.

TOTAL REQUIRED _____ DATE REQUIRED _____

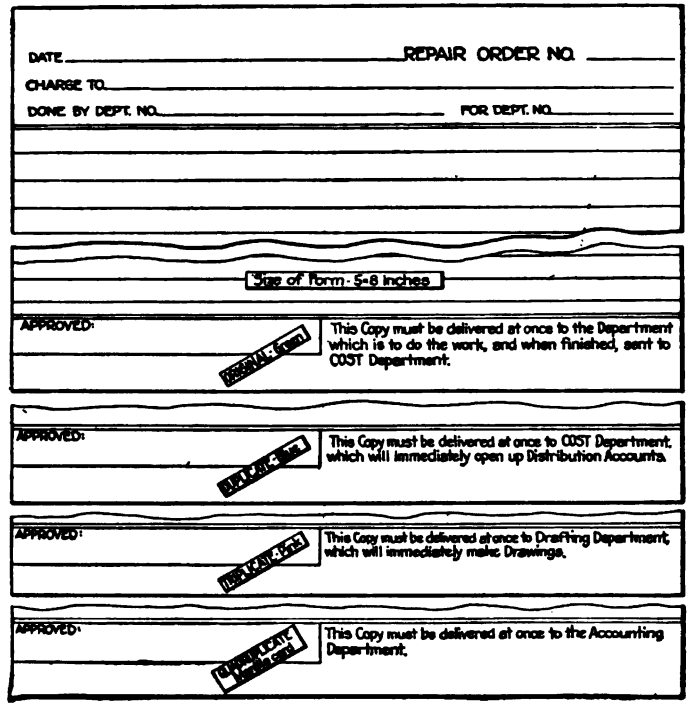
STARTED				FINISHED			STARTED				FINISHED		
Lot No.	Date	Quan.	Cumulative	Date	Quan.	Cumulative	Lot No.	Date	Quan.	Cumulative	Date	Quan.	Cumulative

Reverse side of quadruplicate of above form. Manilla card. Size of form 5 x 8 inches.

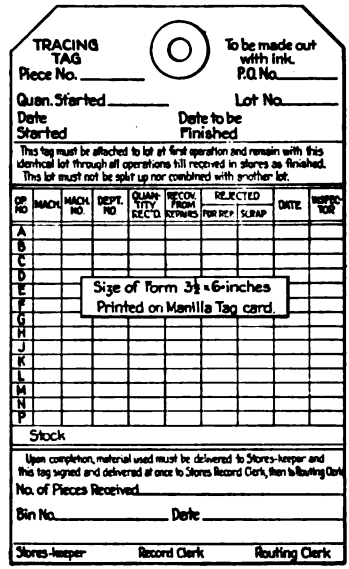
Form 40. Production Order



Form 41. Betterment Order



Form 42. Repair Order


TRACING TAG
Piece No. _____
To be made out with ink.
P.O. No. _____
Quan. Started _____
Lot No. _____
Date Started
Date to be Finished
This tag must be attached to lot at first operation and remain with this identical lot through all operations till received in stores as finished. This lot must not be split up nor combined with another lot.

OP. NO	MACH.	MACH. NO.	DEPT. NO	QUANTITY REC'D.	RECOV. FROM REPAIRS	REJECTED FOR REP.	REJECTED SCRAP	DATE	INSPECTOR
A									
B									
C									
D									
E									
F									
G									
H									
J									
K									
L									
M									
N									
P									

Size of Form 3½ × 6 inches Printed on Manilla Tag card.

Stock

Upon completion, material used must be delivered to Stores-keeper and this tag signed and delivered at once to Stores Record Clerk, then to Routing Clerk

No. of Pieces Received _____

Bin No. _____ Date _____

Stores-keeper Record Clerk Routing Clerk

OP. NO	MACH.	MACH. NO.	DEPT. NO.	QUANTITY REC'D.	RECOV. FROM REPAIRS	REJECTED FOR REP.	REJECTED SCRAP	DATE	INSPECTOR
Q									
R									
S									
T									
U									
V									
W									
X									
Y									
Z									
AA									
BB									
CC									
DD									
EE									
FF									
GG									
HH									

Reverse side of above form.

Stock

Remarks

Form 43. Tracing Tag

DAY-WORK PRODUCTION TICKET NO.

PROD. ORDER NO. | OPERATION NO. | LOT NO.

DATE ISSUED | DATE TO BE COMPLETED | DEPT. NO. | MACH. NO. | MAN'S NO.

QUANTITY WANTED | PIECE NO. | PIECE NAME

TIME ALLOWANCE H. M. | MOVED FROM DEPT. NO. | MOVED FROM MACH. NO. | MOVED TO DEPT. NO. | MOVED TO MACH. NO.

ROT. NO	INSTRUCTIONS	SPEED FEED	TOOLS REQUIRED

Size of form 4×6 inches
Original - white paper;
Duplicate - manilla card.

NO. OF PIECES RECEIVED FOR THIS OPERATION BY WORKMAN

THESE SPACES TO BE FILLED IN BY INSPECTOR

DATE FINISHED	REJECTED: FOR REPAIRS	REJECTED: FOR SCRAP	GOOD	INSPECTOR

This Ticket must be retained until Lot specified is completed and then turned in at once to Production Department.
Last day of each month all Tickets must be turned in and if Lot is uncompleted must be so stamped and Blue Ticket will be issued to complete same.

TIME ON DAY-WORK TICKET NO.

STOPPED	STARTED	TIME: REGULAR	TIME: OVER	REMARKS
	TIME USED			
HOURLY RATE	COST REG. TIME			
OVERTIME HOURS	BONUS EARNED			
	TOTAL COST			

Reverse side of Duplicate of the form shown above.

Form 44. Day-Work Production Ticket, including Time on Day-Work Ticket

PIECE-WORK PRODUCTION TICKET NO.

PROD. ORDER NO. | OPERATION NO. | LOT NO.

DATE ISSUED | DATE TO BE COMPLETED | DEPT. NO. | MACH NO. | MAN'S NO.

QUANTITY WANTED | PIECE NO. | PIECE NAME

MOVED FROM DEPT. NO. | MOVED FROM MACH. NO. | MOVED TO DEPT. NO. | MOVED TO MACH. NO.

ROT. NO.	INSTRUCTIONS	SPEED FEED	TOOLS REQUIRED

Size of form 4×6 inches
Original - white paper - ruling red
Duplicate - buff card - ruling red

NO. OF PIECES RECEIVED FOR THIS OPERATION BY WORKMAN	THESE SPACES TO BE FILLED IN BY INSPECTOR				
	DATE FINISHED	REJECTED FOR REPAIRS	REJECTED FOR SCRAP	GOOD	INSPECTOR

TIME ON PIECE-WORK TICKET NO.

STOPPED	STARTED	TIME REGULAR	TIME OVER	REMARKS

Reverse side of Duplicate of the form shown above

SCHEDULE TIME ALLOWED		TIME USED				
MACH. RATE		AMOUNT EARNED				
PIECE RATE						
MAN'S HOURLY RATE						

Form 45. Piece-Work Production Ticket, including Time on Piece-Work Ticket

PREMIUM PRODUCTION TICKET NO.

PROD. ORDER NO. | OPERATION NO. | LOT NO.

DATE ISSUED | DATE TO BE COMPLETED | DEPT. NO. | MACH. NO. | MANS NO.

QUANTITY WANTED | PIECE NO. | PIECE NAME

STANDARD TIME EA. | TIME M. ALLOWANCE H. M. | MOVED FROM DEPT. NO. | MOVED FROM MACH NO. | MOVED TO DEPT. NO. | MOVED TO MACH. NO.

OPR. NO.	INSTRUCTIONS	SPEED FEED	TOOLS REQUIRED

Size of form - 4×6 inches
Original - white paper - red ruling
Duplicate - buff card - " "

NO. OF PIECES RECEIVED FOR THIS OPERATION BY WORKMAN	THESE SPACES TO BE FILLED IN BY INSPECTOR				
	DATE FINISHED	REJECTED FOR REPAIRS	REJECTED FOR SCRAP	GOOD	INSPECTOR

TIME ON PREMIUM TICKET NO.

STOPPED	STARTED	TIME REGULAR	TIME OVER	REMARKS

Reverse side of Duplicate of the Form shown above

TIME ALLOWED		TIME USED	
LESS SPOILAGE TIME		COST REG. TIME	
TIME SAVED		PREMIUM EARNED	
HOURLY RATE		TOTAL COST	

Form 46. Premium Production Ticket, including Time on Premium Ticket

DAILY DAY-WORK PRODUCTION TIME SLIP
FOR TIME ON DAILY DAY-WORK PROD. TICKET NO.

PROD. ORDER NO. | OPERATION NO. | LOT NO.

PIECES MADE | MACH. NO. | DEPT. NO. | MAN'S NO.

STOPPED	STARTED	ELAPSED TIME	
			REGULAR TIME
	Size of form- 2¾ ×6 inches Printed and ruled in black		
			OVER-TIME

THESE SLIPS MUST BE TURNED IN DAILY

O.K. _____ FOREMAN / CLERK

Form 47. Daily Day-Work Production Time Slip

DAILY PIECE-WORK PRODUCTION TIME SLIP
FOR TIME ON DAILY PIECE-WORK PROD. TICKET NO.

PROD. ORDER NO. | OPERATION NO. | LOT NO.

PIECES MADE | MACH. NO. | DEPT. NO. | MAN'S NO.

STOPPED	STARTED	ELAPSED TIME	
			REGULAR TIME
	Size of form- 2¾ ×6 inches Printed and ruled in green		
			OVER-TIME

THESE SLIPS MUST BE TURNED IN DAILY

O.K. _____ FOREMAN / CLERK

Form 48. Daily Piece-Work Production Time Slip

DAILY PREMIUM PRODUCTION TIME SLIP
FOR TIME ON DAILY PREMIUM PROD. TICKET NO

PROD. ORDER NO. | OPERATION NO. | LOT NO.

PIECES MADE | MACH. NO. | DEPT NO. | MAN'S NO.

STOPPED	STARTED	ELAPSED TIME	
			REGULAR TIME
	Size of form - 2¾ × 6 inches Printed and ruled in red.		
			OVER-TIME

THESE SLIPS MUST BE TURNED IN DAILY | O.K. | FOREMAN — CLERK

Form 49. Daily Premium Production Time Slip

DAILY DEFECTIVE REPAIRS TIME TICKET

RATE | DEPT NO. | MAN'S NO.

	TIME	AMOUNT	NO. OF PIECES	PIECE NO.	PROD. ORD. NO.
STOPPED					
STARTED					
STOPPED					
STARTED					
TOTAL					

DESCRIPTION OF WORK AND REASON FOR REPAIRS

Size of Form - 4 × 6 inches Printed on blue card

Form 50. Daily Defective Repairs Time Ticket

DAILY WAITING TIME TICKET

MAN'S NO. _____

DEPT. NO. _____

REGULAR TIME	DESCRIPTION OF WORK
STOPPED	
STARTED	
OVERTIME — TIME USED	
STOPPED	
STARTED	
TIME USED	

NO. HOURS REGULAR TIME _____ HOURLY RATE _____ REGULAR TIME $_____

NO. HOURS OVERTIME _____ HOURLY RATE _____ OVERTIME $_____

TOTAL COST $_____

Size of form - 4 × 6 inches
Printed on manilla card.

THESE TICKETS MUST BE TURNED IN DAILY.

_____ FOREMAN

Form 51. Daily Waiting Time Ticket

DAILY BETTERMENT TIME TICKET

MAN'S NO. _____

BETTERMENT ORDER NO. _____

DEPT. NO. _____

REGULAR TIME	DESCRIPTION OF WORK
STOPPED	
STARTED	
OVERTIME — TIME USED	
STOPPED	
STARTED	
TIME USED	

NO. HOURS REGULAR TIME _____ HOURLY RATE _____ REGULAR TIME $_____

NO. HOURS OVERTIME _____ HOURLY RATE _____ OVERTIME $_____

TOTAL COST $_____

Size of form - 4 × 6 inches
Printed on manilla card

THESE TICKETS MUST BE TURNED IN DAILY

_____ FOREMAN

Form 52. Daily Betterment Time Ticket

DAILY REPAIR TIME TICKET

MAN'S NO. _____

REPAIR ORDER NO. _____ DEPT. NO. _____

REGULAR TIME		DESCRIPTION OF WORK
	STOPPED	
	STARTED	
OVERTIME	TIME USED	
	STOPPED	
	STARTED	
	TIME USED	

NO. HOURS REGULAR TIME _____ HOURLY RATE _____ REGULAR TIME $ _____

NO. HOURS OVERTIME _____ HOURLY RATE _____ OVERTIME $ _____

THESE TICKETS MUST BE TURNED IN DAILY.

Size of Form - 4 × 6 inches Printed on manilla card.

TOTAL COST $ _____

_____ FOREMAN

Form 53. Daily Repair Time Ticket

DAILY PRORATING ORDER TIME TICKET

MAN'S NO. _____

PRORATING ORDER NO. _____ DEPT. NO. _____

REGULAR TIME		DESCRIPTION OF WORK
	STOPPED	
	STARTED	
OVERTIME	TIME USED	
	STOPPED	
	STARTED	
	TIME USED	

NO. HOURS REGULAR TIME _____ HOURLY RATE _____ REGULAR TIME $ _____

NO. HOURS OVERTIME _____ HOURLY RATE _____ OVERTIME $ _____

THESE TICKETS MUST BE TURNED IN DAILY.

Size of Form - 4 × 6 inches Printed on manilla card.

TOTAL COST $ _____

_____ FOREMAN

Form 54. Daily Prorating Order Time Ticket

DAILY NON-PRODUCTIVE LABOR TICKET

MAN'S NO. _____

DEPT. NO. _____

REGULAR TIME	DESCRIPTION OF WORK
STOPPED	
STARTED	
OVERTIME TIME USED	
STOPPED	
STARTED	
TIME USED	

NO. HOURS REGULAR TIME _____ HOURLY RATE _____ REGULAR TIME $ _____

NO. HOURS OVERTIME _____ HOURLY RATE _____ OVERTIME $ _____

TOTAL COST $ _____

Size of Form - 4 × 6 inches
Printed on manilla card.

THESE TICKETS MUST BE TURNED IN DAILY

_____ FOREMAN

Form 55. Daily Non-Productive Labor Ticket

SUPPLEMENTARY TAG

Lots must not be split except on emergency, and must not be combined with another lot

Piece No. _____ PO _____

Part of Lot No _____

Taken from Lot for Operation No. _____

Op Name _____

Date _____ By whom _____

Taken from Dept. No _____

Reason _____

Balance of operations and routing must be copied below from original Tag

OP NO	MACH	MACH NO	DEPT NO	QUAN REC'D	REJECTED FOR REP	REJECTED SCRAP	DATE	INSPECTOR

Size of Form - 3½ × 6¼ inches
Printed on Red Tag card

Upon completion, material must be delivered to Stores-keeper and this tag signed and delivered at once to Stores Record Clerk, then to Schedule Clerk.

No. of Pieces received _____

Bin No _____ Date _____

Stores-keeper _____

Record Clerk _____

Form 56. Supplementary Tag

Indicates a green band across tag

REJECTED FOR SCRAP

Defect

Date Rejected

Lot No	No. of Pieces Rejected	Piece No.	Made on Prod. Order No.	Rejected at Operation No.	Rejected at Operation Name

Different pieces or the same pieces requiring different repairs or made on different production orders must not be put on this tag.

REASON FOR REJECTION

Size of Form - 3½ × 6¼ inches
Printed on Manilla Tag Card

Received above _____ Pieces

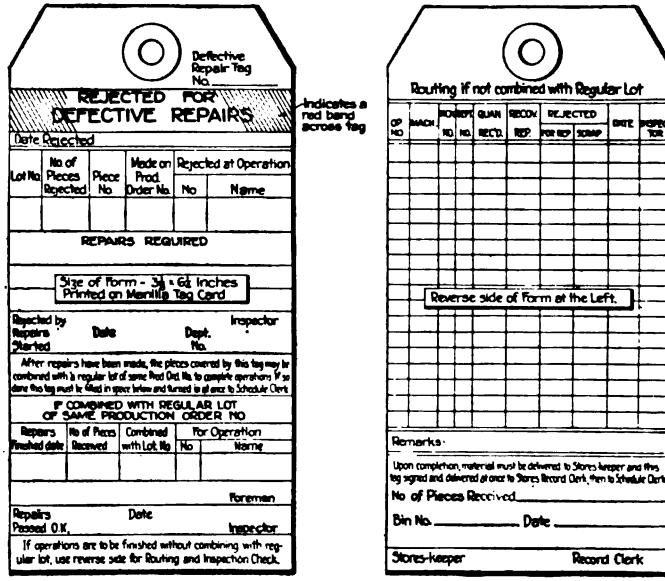
for Scrap Date _____

_____ Stores-keeper

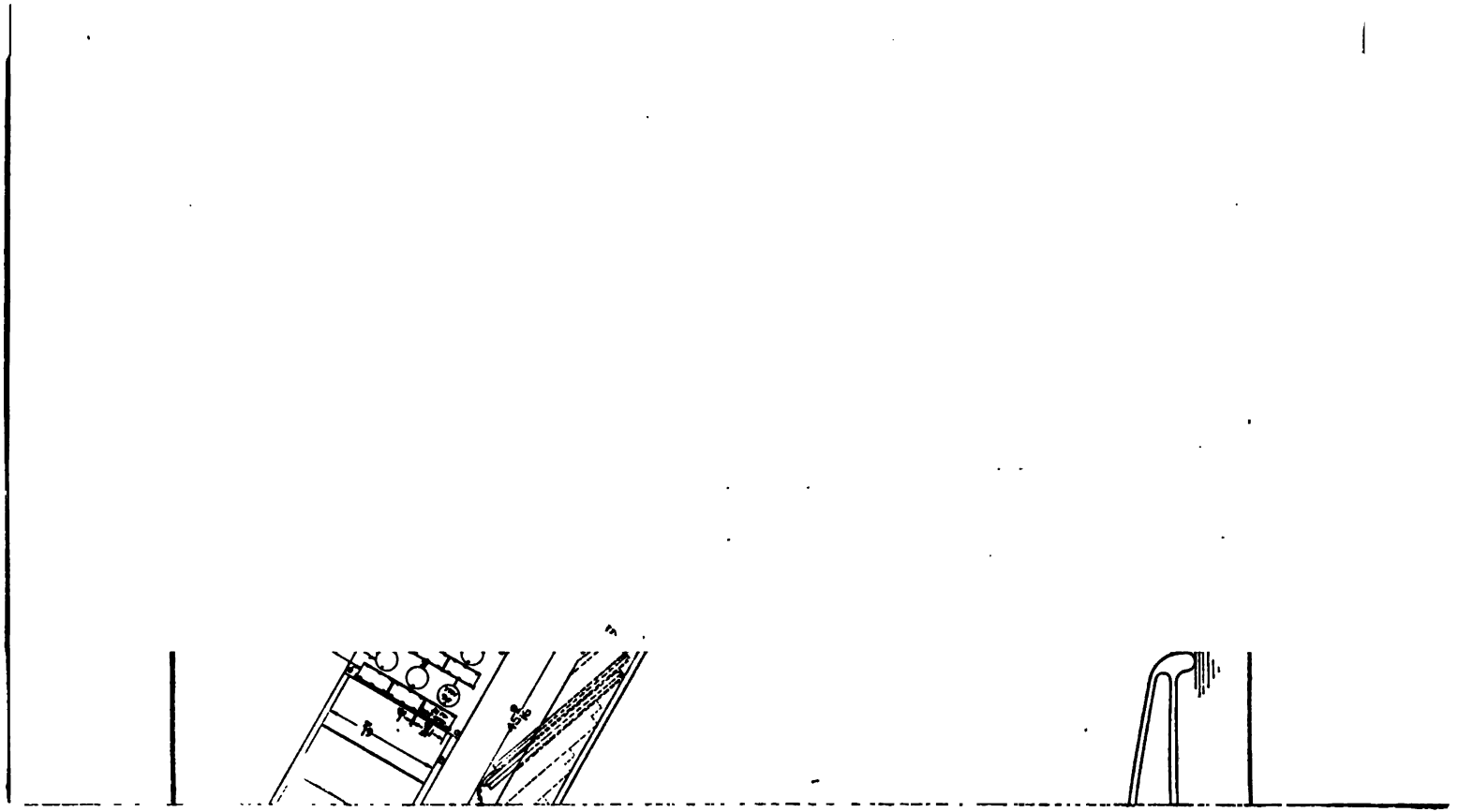
Ent Credit Prod. Ord. Record _____ Clerk

Ent Chg. to Scrap Acct _____ Clerk

Form 57. Rejected for Scrap Tag



Form 58. Rejected for Defective Repairs Tag



FORMS

RELATING TO LABOR

(Forms referred to in Chapter XI)

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

APPLICATION FOR EMPLOYMENT.

Name in Full _____ Date _____ 19__

Address _____

Trade _____

Nationality _____ Place of Birth _____ Age _____

If of foreign Birth, how long have you been in United States _____

Naturalized _____ Married or Single _____ No. of Children _____

Previously in our employ? _____ Date _____ Dept. _____

Experience _____

Size of Form - 4 × 6 inches
Printed on Manilla card.

Reference _____

Name of Relatives employed by Rogers Motor Works _____

DO NOT WRITE BELOW THIS LINE.

Date Employed _____ Dept. No. _____ Application No. _____ File No. _____

Date Re-employed _____ Dept. No. _____

Date Re-employed _____ Dept. No. _____

INDICATE BELOW THE POSITIONS YOU HAVE HELD, GIVING IN THE TOP SPACE YOUR LAST EMPLOYER.

EMPLOYER	POSITIONS YOU HAVE HELD	APPROXIMATE DATE OF EMPLOYMENT		WAGES
		FROM	TO	
NAME ADDRESS				
NAME ADDRESS				
NAME ADDRESS				
NAME ADDRESS				

Reverse side of form shown above

Are you working at present? _____

How soon can you report for work? _____

(OVER)

Form 61. Application for Employment

LETTER APPLICATION FOR EMPLOYMENT

ROGERS MOTOR WORKS

BRIDGEPORT, CONN.

File No.....
Application No.....

Name in Full..... Date.....191....
Address (Street and No.)..... City or Town..... State.....

Indicate by a cross (×) the positions you desire and are competent to fill.

....Auditor
....Accountant
....Bookkeeper
....Ledger Clerk
....Cost Accountant
....Cost Clerk
....Clerk
....Bill Clerk
....File Clerk
....Billing Machine Operator
Kind of Machine Used?.....
....Correspondent
....Private Secretary
....Stenographer
....Typist
....Telephone Operator

....Inventory Clerk
....Stores-Keeper
....Pay-Roll Clerk
....Timekeeper

....Buyer { Of What? .... }

....Manager { Of What? .... }

....Supt. { Of What? .... }

....Foreman { Of What? .... }

....Architect
....Chemist
....Metallurgist

Engineer { ....Civil, ...Electrical, ...Mechanical }

Draughtsman { ....Architectural, ...Detailer, ...Electrical, ...Mechanical, ...Structural, ...Topographical, ...Tracer }

....Estimator { Of What? .... }

....Designer { Of What? .... }

Add any other positions you can fill.
.....
.....
.....
.....
.....

Least salary you would consider at start.....
Nationality .....Religion..... Age.....
Where born?.....If of foreign birth, years you have been in in U. S.....Naturalized?.....
Married.....Number of Children.....Relatives depending upon you for support.....
General health.....Physical defects.....
Languages you speak.....
Languages you write.....
Schools attended and years.....Year graduated.....
College attended and years.....Year graduated.....Degree .....
Other education.....

Form 62. (a) Letter Application for Employment (face). Size, 8 x 12 inches

Business Records and References

It is *essential* that you give below full information regarding your present and past employment, *strictly* following this form. Be careful to state correct time and salaries of positions held in order that they may correspond with references.

Employers	Addresses (Give Street, Number, City, and State)	Business	Are They Still in Business?	Person Under Whom You Worked	Position You Held	Date of Employment, Give Month and Year		Exact Salary Received
						From	To	
Present								
Next Previous								

If any of the above employers are out of business, give name and address of person under whom you worked.....

Shall we write to your present employer?.....

Consider this question carefully, as it may cost you your present position if your employer thought you were seeking employment elsewhere.

Reason for changing your present position.....

If any great length of time elapsed between dates of employment, state what you were doing.....

.....

Important. State principal duties of positions mentioned under "Business Record" in same consecutive order and reasons for leaving said positions:

.....

.....

.....

.....

Other References

If for any reason you are unable to give at least 3 past employers as references in above record, give enough additional under this heading to make at least 3 references.

Names	Addresses	City and State	Business or Position	State whether Relative, Friend, or Business Acquaintance

Send *copies* of any recommendations you may have

Form 62. (b) Letter Application for Employment (back)

REFERENCE INQUIRY LETTER
ROGERS MOTOR WORKS

File No.....

Bridgeport, Conn.,.....191..

.....

.....

Application No.....

.....has filed an application with us for employment and gives your name as one of h.... past employers, working under .....

We shall very much appreciate an early reply to the questions on the back fold of this sheet, and thank you in advance for your attention to the matter, which will be treated confidentially.

Very truly yours,

ROGERS MOTOR WORKS,

By.....

Form 63. (a) Reference Inquiry Letter (first page of fold). Size of folded page, 6 × 8 inches

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.
REPLY FORM

Application No..... Name.....

.....191..

Period of employment.....
Date of termination.....
Cause of termination.....
Salary $..... per.....
In what capacity was....he.....
Was....he competent?.....
Was....he reliable?.....
Was....he honest?.....
Was he in the habit of using intoxicating liquors to excess?.....
Would you consider h.... worthy of confidence and so recommend h.... for a similar position.....
Remarks .....
.....

Name of employer.....

By.....

Form 63. (b) Reference Inquiry Letter (fourth page of fold—inside pages blank)

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

DATE

REQUISITION FOR HELP

BUILDING NO.	FLOOR NO.	DEPT. NO.	TIME STATION NO.

NUMBER WANTED	KIND OF MEN WANTED	DATE WANTED	APPROXIMATE RATE	

Size of Form - 4×6 inches
Printed on Manilla Card

STATE ABOVE, NATURE OF WORKMEN WANTED

MAKE OUT SEPARATE REQUISITION FOR EACH KIND OF MEN WANTED

ASST FOREMAN

FOREMAN

APPROVED _____ SUP'T.

APPROVED _____ WORKS MGR.

NAMES OF MEN SENT FOR	DATE	REMARKS

Reverse side of Form above

Form 64. Requisition for Help

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

EMPLOYEE'S RATE CARD

NAME _____ DATE EMPLOYED _____ A.M. _____ P.M. _____

ADDRESS _____

FOR DEPT. NO. _____ BUILDING NO. _____ FLOOR NO. _____ TIME STATION NO. _____

TIME CLOCK NO. _____ RATE PER HOUR WEEK _____

TRADE _____

NATIONALITY _____ NATURALIZED _____ MARRIED _____ CHILDREN _____

CHANGE OF WAGES	DATE											
	RATE											

CHANGE OF DEPT.	DATE											
	DEPT. NO.											
	CLOCK NO.											

Size of Form - 4×6 inches. Printed on Manilla card.

O.K. _____ DIVISION HEAD _____ SUPT. _____

DATE QUIT _____ CAUSE _____

ALL CHANGES IN RATES MUST TAKE PLACE AT COMMENCEMENT OF A PAY PERIOD.

ABSENT RECORD

	HOURS			HOURS			HOURS			HOURS			HOURS			HOURS	
DATE	A.M.	P.M.	DATE	A.M.	P.M.	DATE	A.M.	P.M.	DATE	A.M.	P.M.	DATE	A.M.	P.M.	DATE	A.M.	P.M.

Reverse side of Form shown above.

ABSENCE MUST BE SHOWN FROM EVERY HALF HOUR UP.

Form 65. Employee's Rate Card, including Absent Record

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

INTRODUCTION CARD

BUILDING NO. FLOOR NO. DEPT. NO. TIME STATION NO.

To _____

_____ in Dept. No.

The bearer _____

is sent to you in response to your order _____ 191__

for _____

Wages _____ per hour:

Size of form-4×6 inches
Printed on Manilla card

Employment Dept.

To be filled out and returned immediately to Employment Dept.

Started work at _____ o'clock. Month _____ Day _____

Noted _____ Supt. By _____

Asst. Foreman.

Form 66. Introduction Card

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

CHANGE IN RATE

NAME _____ CLOCK NO.

OCCUPATION _____ DEPT. NO.

COMMENCING	FROM	TO
DATE		

FORMER CHANGE (TO BE FURNISHED BY ACCOUNTING DEPT.)	FROM	TO

REASON _____

Size of form - 4×6 inches
Printed on Manilla card.

CHANGES OF RATE WILL TAKE PLACE ONLY AT THE BEGINNING OF A PAY PERIOD.

_____ FOREMAN

_____ DIVISION HEAD

APPROVED _____ SUPT.

APPROVED _____ WORKS MANAGER

Form 67. Change in Rate Card

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

CHANGE OF DEPARTMENT

NAME _____ CLOCK NO. _____

OCCUPATION _____ DEPT. _____

COMMENCING	FROM DEPT.	TO DEPT.
DATE		

FORMER WORK	CHANGE OF EMPLOYEE'S NO.	
	FROM NO.	TO NO.
NEW WORK		

REASON _____

Size of Form - 4 × 6 inches
Printed on Manilla card

_____ FOREMAN

ANY CHANGE OF RATE WILL NOT TAKE PLACE UNTIL COMMENCEMENT OF A PAY PERIOD.

_____ ASST. FOREMAN

(APPROVED) _____ SUPT.

(APPROVED) _____ WORKS MANAGER.

Form 68. Change of Department Card

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

REPORT OF ABSENTEES

DATE _____ TIME STATION NO. _____ DEPT. NO. _____

CLOCK NO.	ABSENT		CLOCK NO.	ABSENT		CLOCK NO.	ABSENT	
	A.M.	P.M.		A.M.	P.M.		A.M.	P.M.

Size of Form - 4 × 6 inches.
Printed on white paper.

NUMBER PRESENT _____

NUMBER ABSENT _____

SIGNED _____
TIMEKEEPER.

Form 69. Report of Absentees

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

QUITTING CARD

NAME _____ DATE _____

ADDRESS _____

OCCUPATION _____ RATE _____ LENGTH OF SERVICE _____

EMPLOYEE'S REASON _____

FELLOW EMPLOYEE'S REASON _____

INSPECTOR'S OPINION _____

FOREMAN'S RECOMMENDATION _____ Size of form - 4 × 6 inches Printed on Manilla card

ACTION TAKEN _____

IN EFFECT _____ A.M. _____ P.M. _____

SIGNED _____ INDUSTRIAL SEC'Y.

ALWAYS ENCLOSE THESE CARDS IN A SEALED ENVELOPE TO BE FILED WITH ORIGINAL APPLICATION CARD.

RECORD OF EMPLOYEE
FOREMEN WILL FILL OUT THIS CARD.

WORK			ABILITY				CONDUCT		
FAST	AVERAGE	SLOW	EXCELLENT	GOOD	FAIR	POOR	GOOD	FAIR	POOR

INDICATE ABOVE BY PUTTING X IN SQUARES

WAS HE ABSENT FROM WORK FREQUENTLY ? _____

HONEST ? _____ LOYAL ? _____

IS THERE ANY REASON WHY HE SHOULD NOT BE RE-EMPLOYED ? _____

Reverse side of form shown above

TO CASHIER : _____

PAY THE ABOVE-NAMED PERSON FOR _____ HRS. _____ MIN.

@ _____ PER HOUR, NO. PIECES _____ @ PER _____ AMOUNT _____

_____ O.K. _____

FOREMAN HEAD OF DIVISION

Form 70. Quitting Card, including Record of Employee

ROGERS MOTOR WORKS
BRIDGEPORT, CONN.

MONTHLY RECORD OF EMPLOYEES DISMISSED OR RESIGNED

Dept. No. _____ Year 19___

MONTH	JAN.		FEB.		MAR.		APR.		MAY		JUNE		JULY		AUG.		SEPT.		OCT.		NOV.		DEC.		TOTAL	
REASONS	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Unsatisfactory work																										
Employee dissatisfied																										
Undesirable employee																										
Another position																										
Ill health																										
Sickness in family																										
Account injury																										
Death																										
References unsatisfactory																										
Attend school																										
Matrimony																										
Remain at home																										
Leaving city																										
Non-attendance																										
Tardiness																										
Never reported																										
No reason																										
Own accord																										
Firm moving																										
Lack of work																										
Refuse to acknowledge error																										
No advance in pay																										
Reduction in pay																										
Stealing																										
No advance																										
Dishonesty																										
Special																										

Size of form - 8½ x 11 inches
Printed on white paper

Total																										
Dept. %																										
COMPARISONS AND PERCENTAGES																										
Total resigned																										
Total dismissed																										
Total out																										
Average No. employed daily																										
% Resigned to avg. E.D.																										
% Dismissed to avg. E.D.																										
% Total out to avg. E.D.																										
No. employees hired daily																										
% Hired to daily avg. E.D.																										
No. advanced in pay																										
No. promoted																										
No. transferred																										

Form 71. Monthly Record of Employees Dismissed or Resigned

PAY CHECK

Received full payment of all demands to and including

(DATE)_____ 19____

REGULAR AND EXTRA TIME	AMOUNT	Sign name here
Regular Time		
Extra Time		
Piece-work		
Total		Address here
Less Adv. acct. Ins.		
Less other Advances		
NET PAY		

NOTE – No money will be delivered until this stub is presented, properly signed; if lost, report at once to Pay Department.

No. _____ Perforation

No. _____

TIME CARD DEPT. _____

NAME _____

PAY PERIOD ENDING _____ 19____

		AMOUNT
No.	Regular Time	
	Extra Time	
	Piece-work	
	Total	
Expense Charge	Less Advances Acct. Ins.	
	Less other Advances	
	NET PAY	

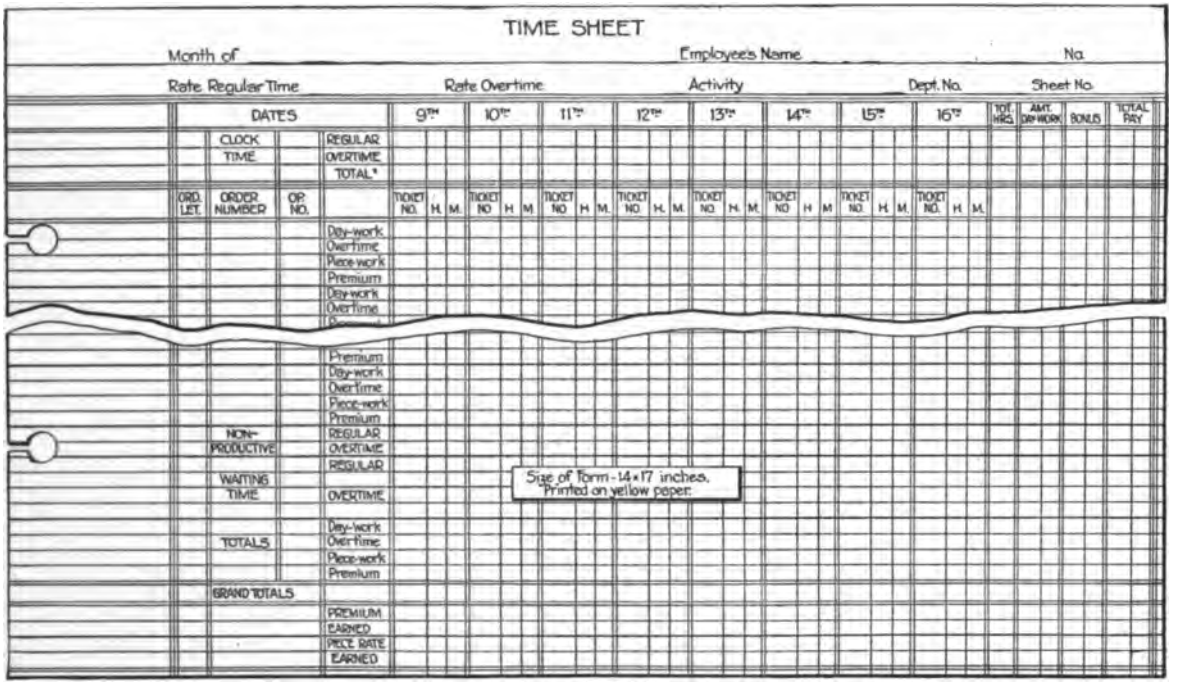
DAY	A.M.	NOON		P.M.	EXTRA TIME		HOURS
	IN	OUT	IN	OUT	IN	OUT	

Size of form – 4 × 9¾ inches
Printed on Manilla card.

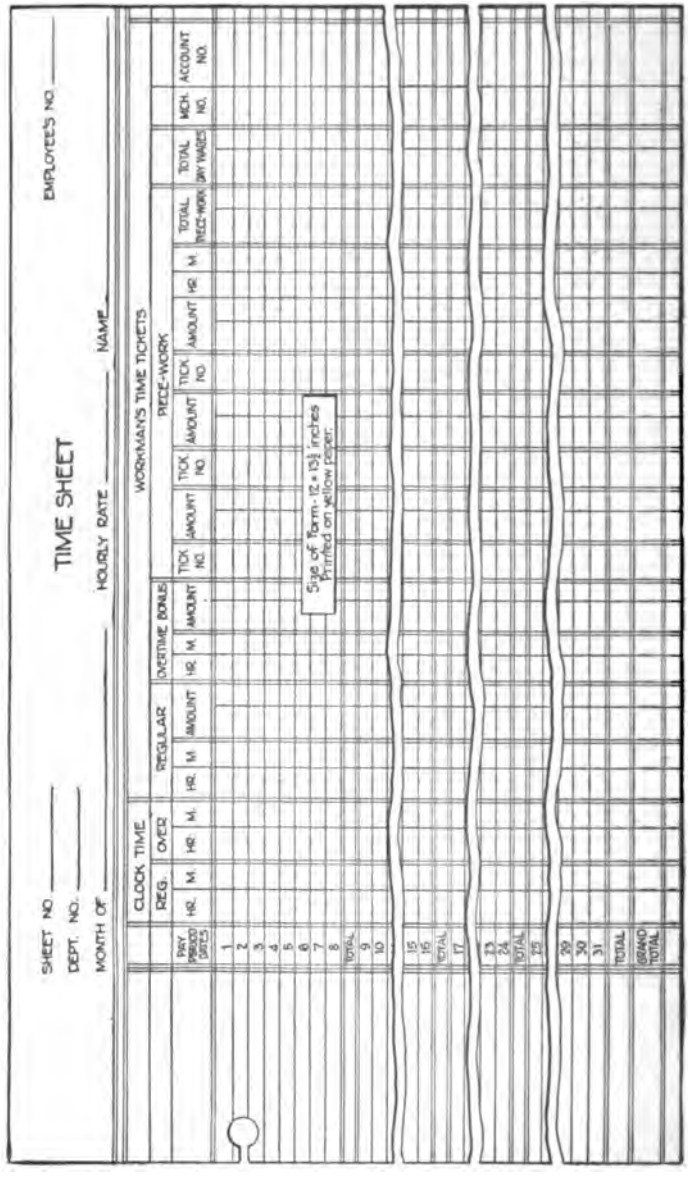
O.K. _____ TIMEKEEPER

APPROVED BY _____ PAYMASTER.

Form 72. Pay Check and Time or Clock Card



Form 73. Time Sheet (First Method)



Form 74. Time Sheet (Second Method)

PAY CHECK

Received full payment of all demands to and including the date below.

SIGNED _____

ADDRESS _____

Detach this stub and be always ready to show it whenever asked for.

NOTE: No money will be delivered until this stub is presented properly signed; if lost, report at once to Pay Department.

NO. _____ DATE _____ CARD NO. _____

CARD NO.

NO. _____ NAME _____ DATE _____

CLOCK CARD

STA. NO. DEPT

CHARGE

O.K. _____ TIMEKEEPER

APPROVED _____ CASHIER

	AMOUNT	
REGULAR TIME		
EXTRA TIME		
PIECE-WORK		
TOTAL		
LESS ADVANCES		
NET PAY		

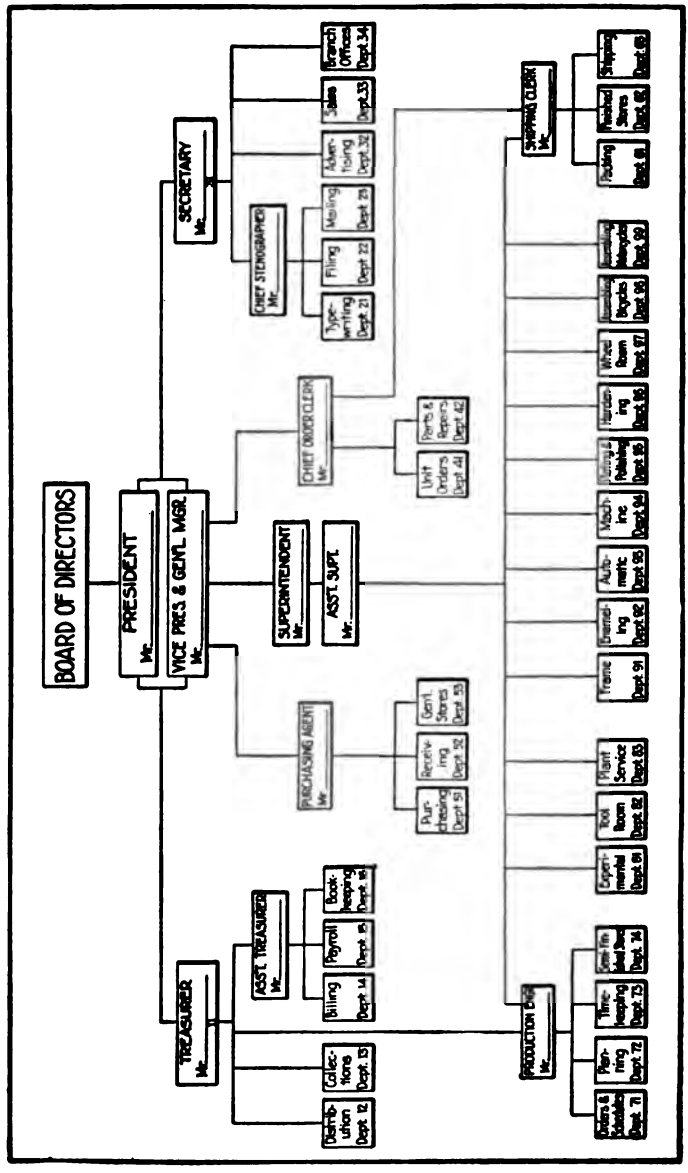
	MON.	TUE.	WED.	THUR.	FRI.	SAT.	SUN	
IN								
OUT								
IN								
OUT								
EXTRA TIME								
TOTAL								
CK								
DIF								
BY								

Form 75. Pay Check and Time Card (Second Method)

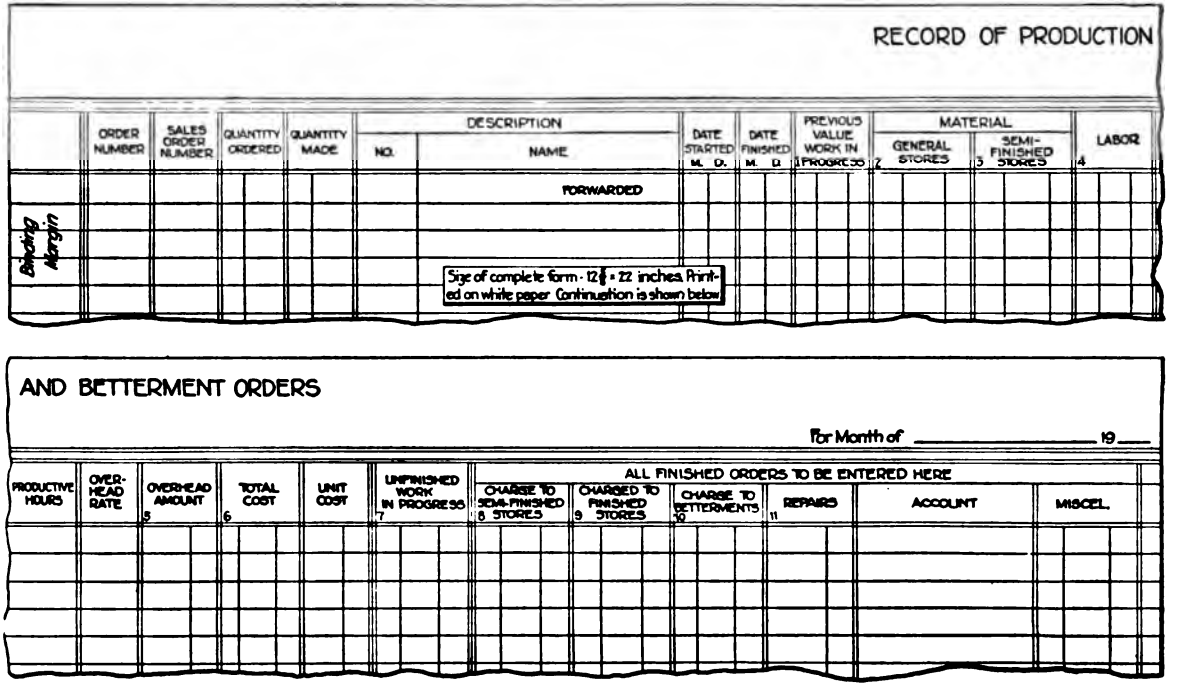
FORMS

ORGANIZATION CHART; DISTRIBUTION AND ANALYSIS SHEETS

(Forms referred to in Chapter XII)



Form 76. Organization Chart



RECORD OF PRODUCTION

	ORDER NUMBER	SALES ORDER NUMBER	QUANTITY ORDERED	QUANTITY MADE	DESCRIPTION NO.	DESCRIPTION NAME	DATE STARTED M. D.	DATE FINISHED M. D.	PREVIOUS VALUE WORK IN PROGRESS 1	MATERIAL GENERAL STORES 2	MATERIAL SEMI-FINISHED STORES 3	LABOR 4
Binding Margin						FORWARDED						

Size of complete form - 12½ × 22 inches. Printed on white paper. Continuation is shown below.

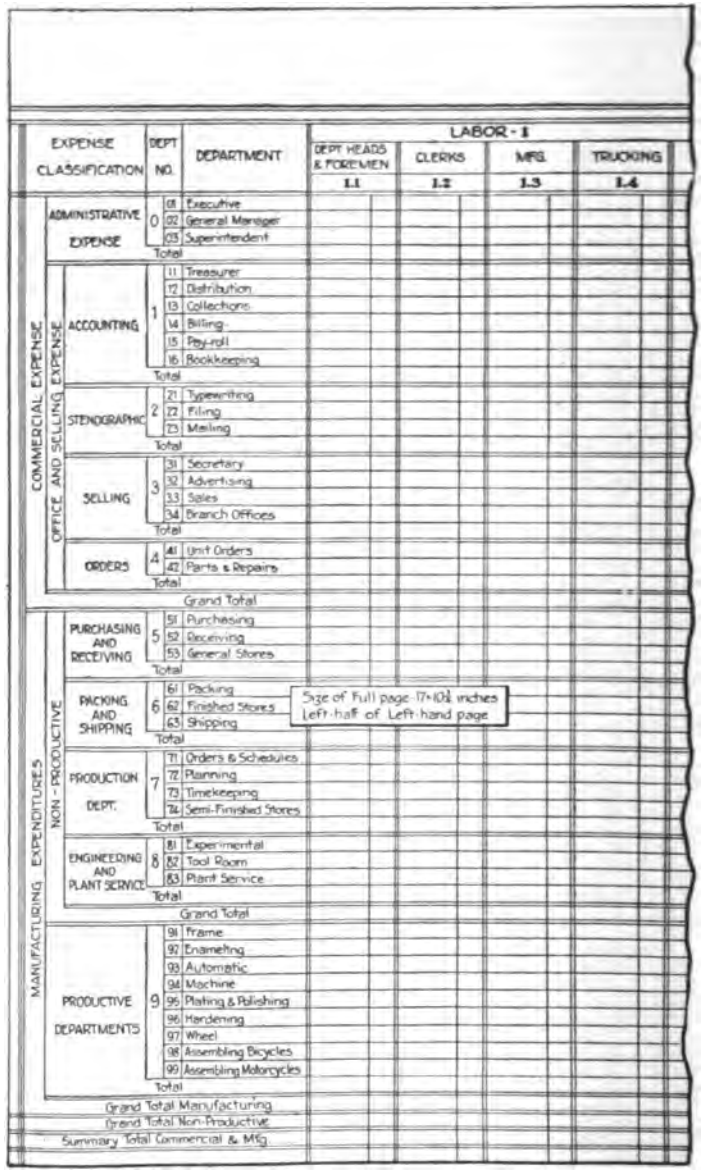
AND BETTERMENT ORDERS

For Month of _____ 19___

PRODUCTIVE HOURS	OVERHEAD RATE	OVERHEAD AMOUNT 5	TOTAL COST 6	UNIT COST	UNFINISHED WORK IN PROGRESS 7	ALL FINISHED ORDERS TO BE ENTERED HERE: CHARGE TO SEMI-FINISHED STORES 8	CHARGED TO FINISHED STORES 9	CHARGE TO BETTERMENTS 10	REPAIRS 11	ACCOUNT	MISCEL.

Form 78. Record of Production, Betterment, and Repair Orders

NOTE—For Form 77, see pages 424 to 427

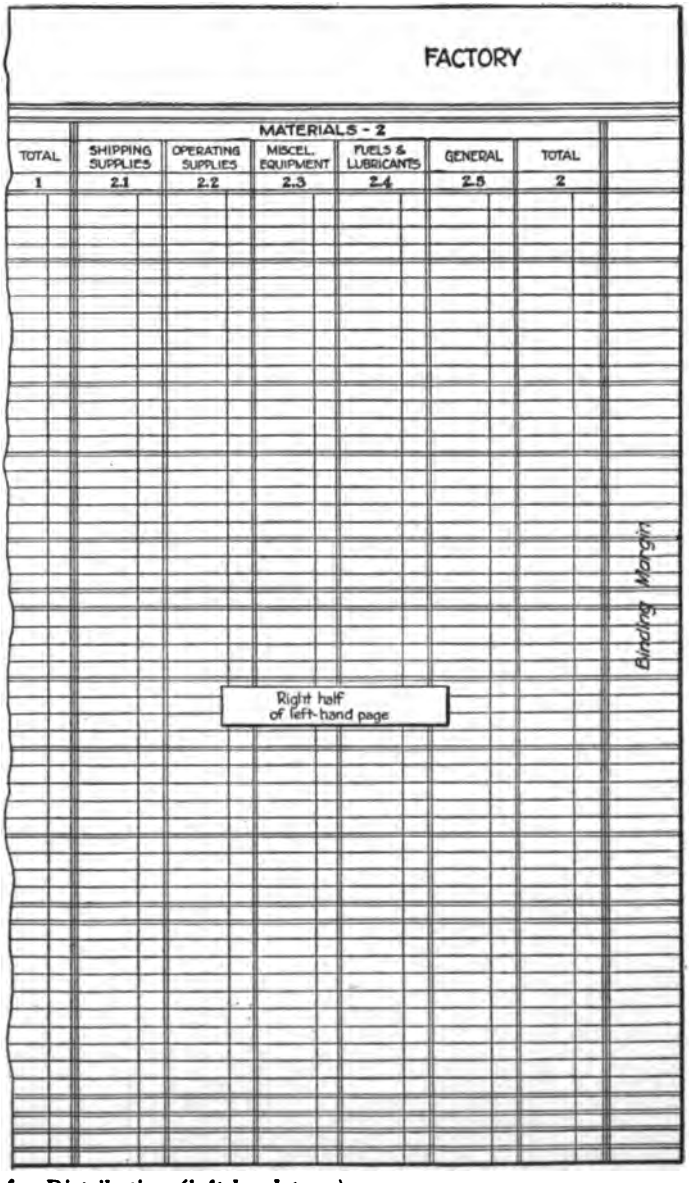


EXPENSE CLASSIFICATION		DEPT NO.	DEPARTMENT	LABOR - 1 DEPT HEADS & FOREMEN 1.1	CLERKS 1.2	MFG. 1.3	TRUCKING 1.4
COMMERCIAL EXPENSE	ADMINISTRATIVE EXPENSE	0	01 Executive				
			02 General Manager				
			03 Superintendent				
			Total				
	OFFICE AND SELLING EXPENSE — ACCOUNTING	1	11 Treasurer				
			12 Distribution				
			13 Collections				
			14 Billing				
			15 Pay-roll				
			16 Bookkeeping				
			Total				
	STENOGRAPHIC	2	21 Typewriting				
			22 Filing				
			23 Mailing				
			Total				
	SELLING	3	31 Secretary				
			32 Advertising				
			33 Sales				
			34 Branch Offices				
			Total				
	ORDERS	4	41 Unit Orders				
			42 Parts & Repairs				
			Total				
			Grand Total				
MANUFACTURING EXPENDITURES	NON-PRODUCTIVE — PURCHASING AND RECEIVING	5	51 Purchasing				
			52 Receiving				
			53 General Stores				
			Total				
	PACKING AND SHIPPING	6	61 Packing				
			62 Finished Stores				
			63 Shipping				
			Total				
	PRODUCTION DEPT.	7	71 Orders & Schedules				
			72 Planning				
			73 Timekeeping				
			74 Semi-Finished Stores				
			Total				
	ENGINEERING AND PLANT SERVICE	8	81 Experimental				
			82 Tool Room				
			83 Plant Service				
			Total				
			Grand Total				
	PRODUCTIVE DEPARTMENTS	9	91 Frame				
			92 Enameling				
			93 Automatic				
			94 Machine				
			95 Plating & Polishing				
			96 Hardening				
			97 Wheel				
			98 Assembling Bicycles				
			99 Assembling Motorcycles				
			Total				
			Grand Total Manufacturing				
			Grand Total Non-Productive				
			Summary Total Commercial & Mfg.				

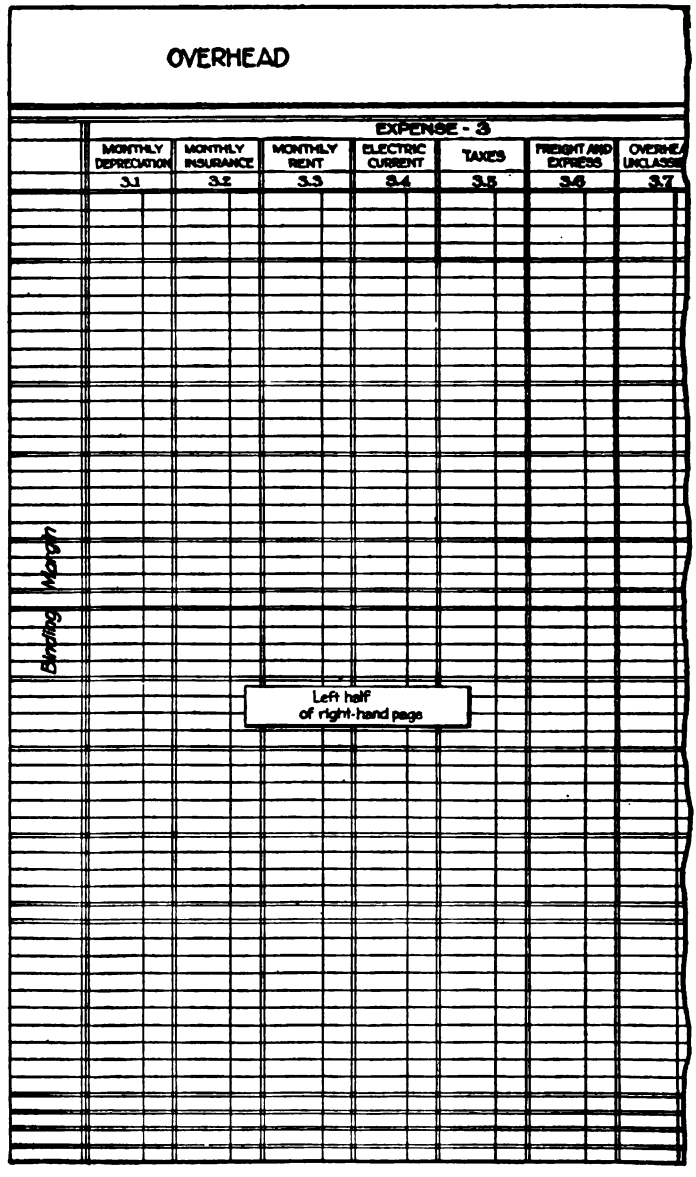
Size of Full page 17×10½ inches
Left-half of Left-hand page

Form 77. (a) Factory Overhead Sheet

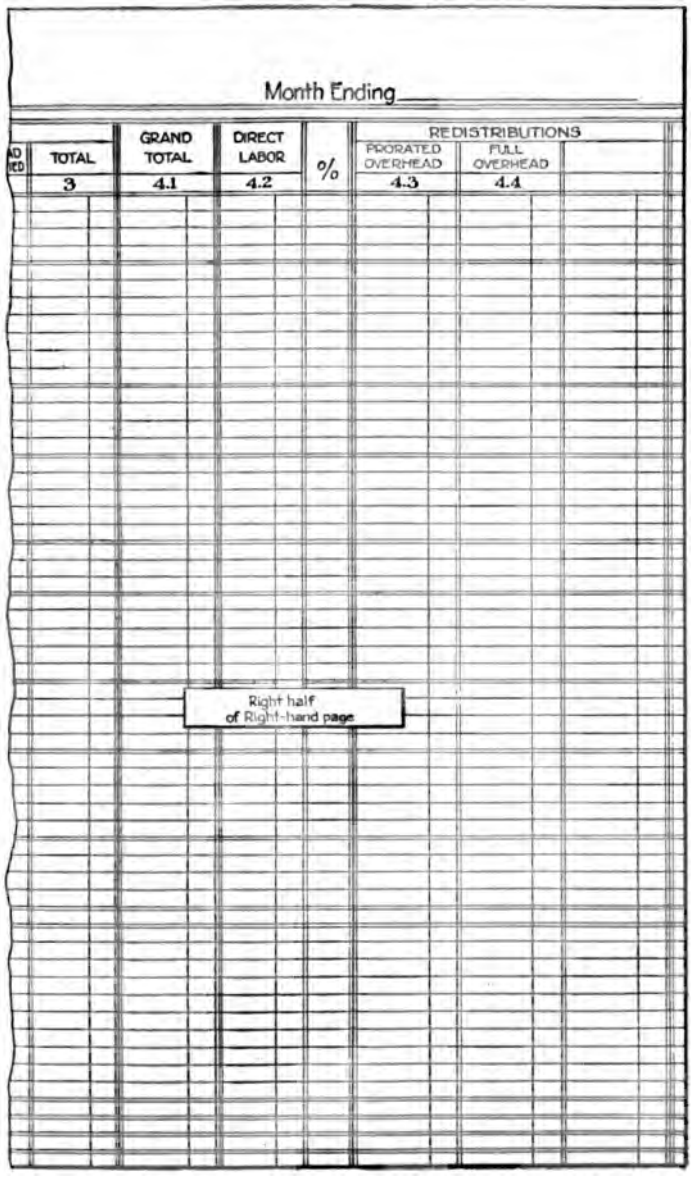
For Form 78, see page 423.



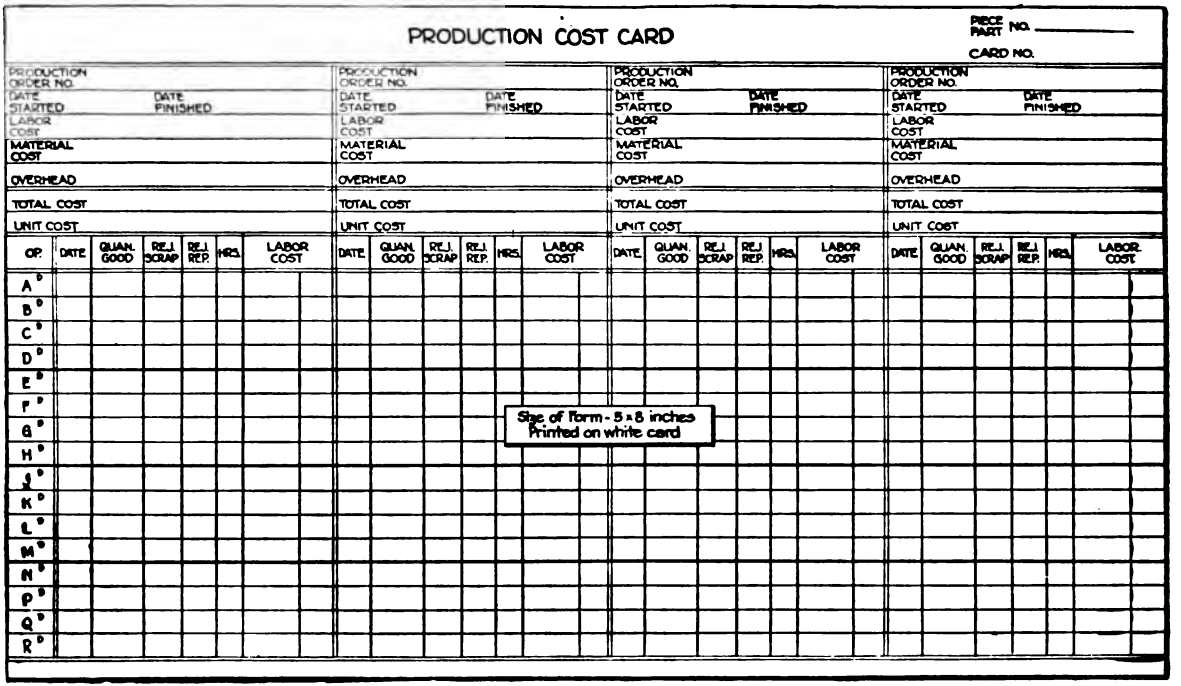
for Distribution (left-hand page)



Form 77. (b) Factory Overhead Sheet



for Distribution (right-hand page)



PRODUCTION COST CARD

PIECE PART NO. _____

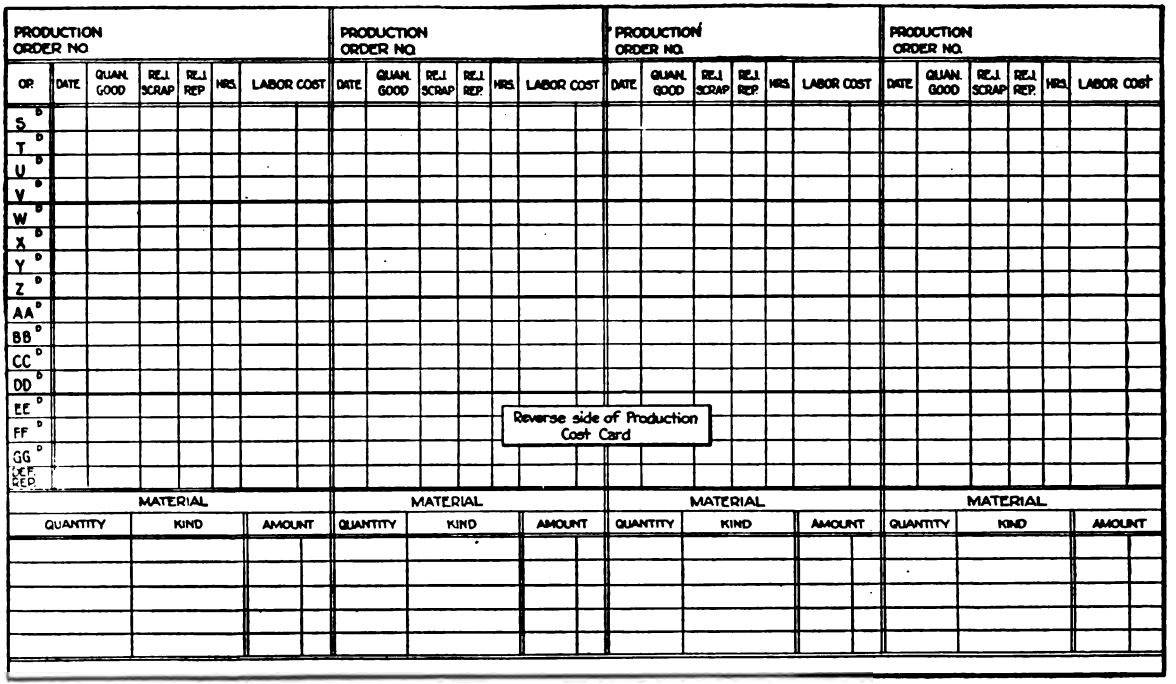
CARD NO.

PRODUCTION ORDER NO.			
DATE STARTED / DATE FINISHED			
LABOR COST			
MATERIAL COST			
OVERHEAD			
TOTAL COST			
UNIT COST			

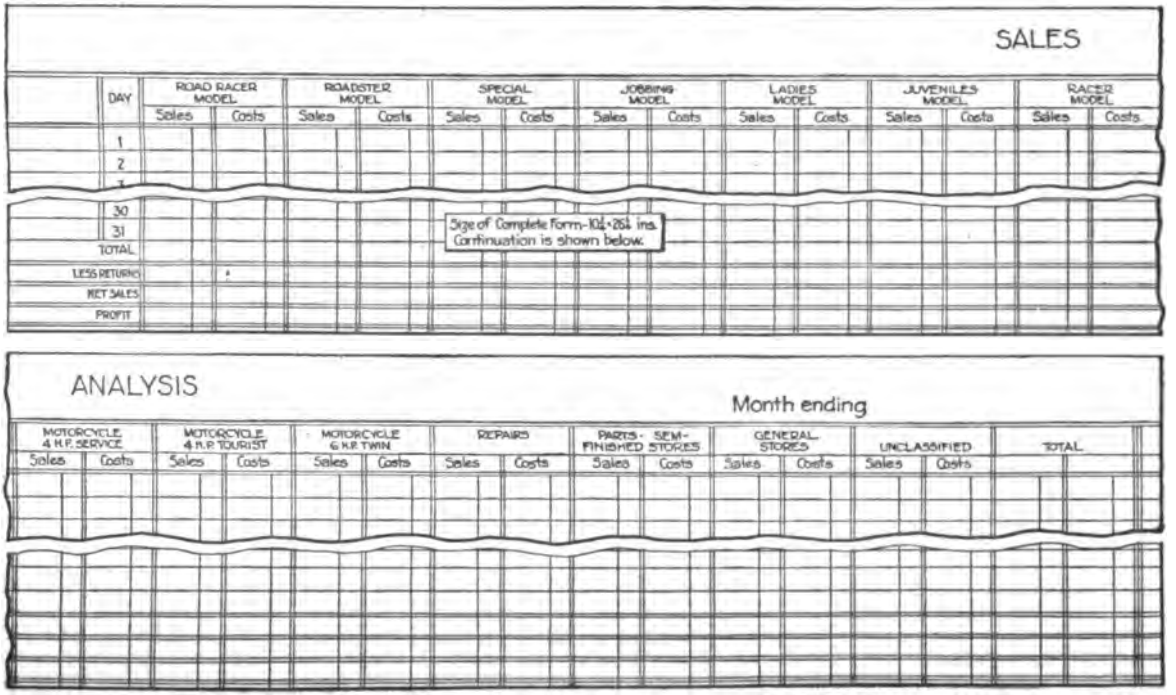
OP.	DATE	QUAN. GOOD	REJ. SCRAP	REJ. REP.	HRS.	LABOR COST	DATE	QUAN. GOOD	REJ. SCRAP	REJ. REP.	HRS.	LABOR COST	DATE	QUAN. GOOD	REJ. SCRAP	REJ. REP.	HRS.	LABOR COST	DATE	QUAN. GOOD	REJ. SCRAP	REJ. REP.	HRS.	LABOR COST
A																								
B																								
C																								
D																								
E																								
F																								
G																								
H																								
J																								
K																								
L																								
M																								
N																								
P																								
Q																								
R																								

Size of form - 5 × 8 inches
Printed on white card

Form 79. (a) Production Cost Card (face)



Form 79. (b) Production Cost Card (back)

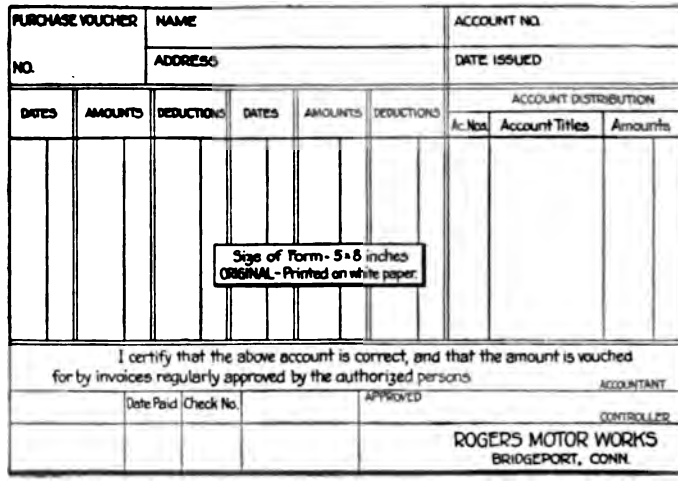


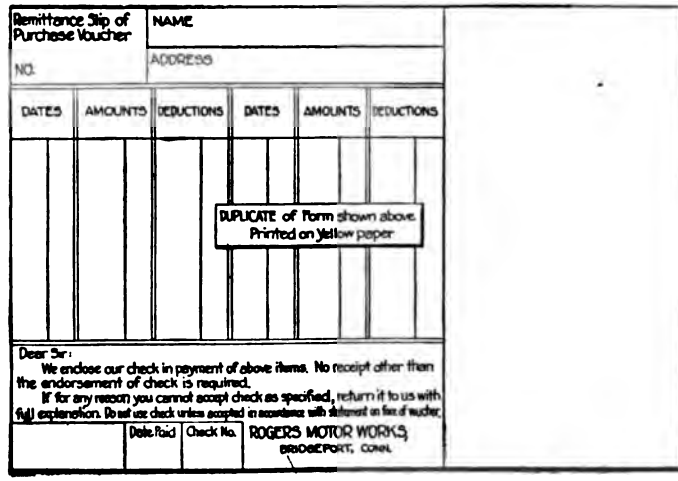
Form 80. Sales Analysis Sheet

FORMS

COMMERCIAL ACCOUNTING

(Forms referred to in Chapter XIII)

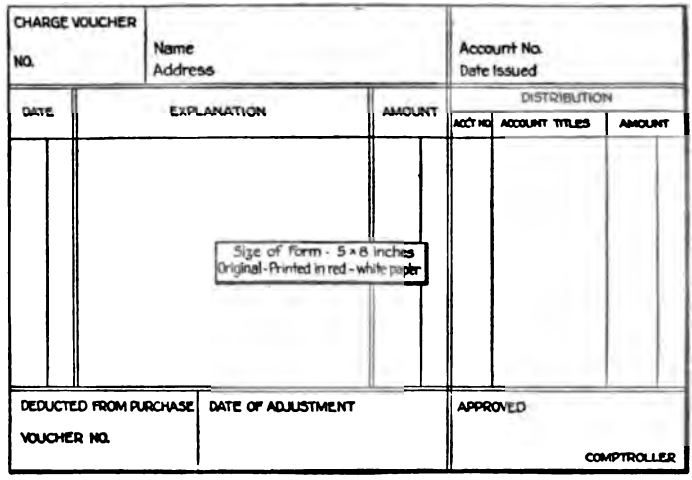


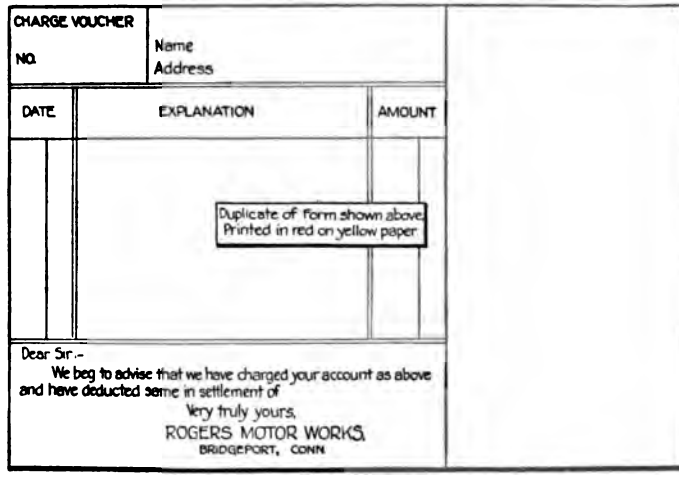


Form 81. Purchase Voucher

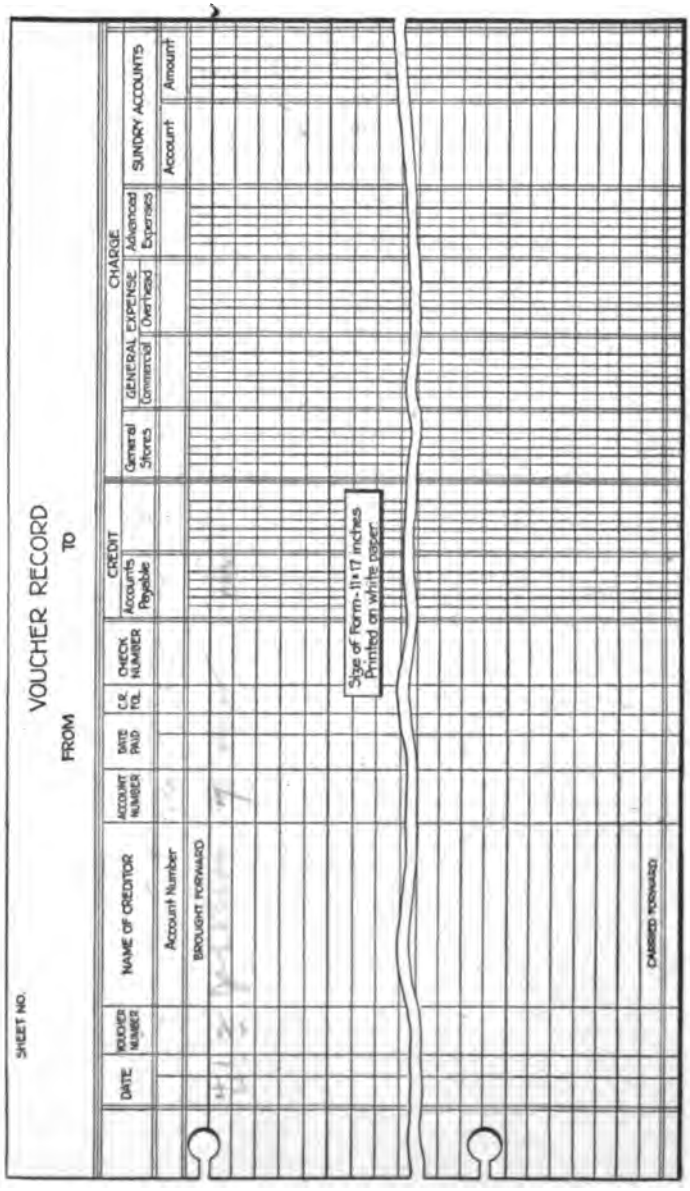
MONTH OF		VOUCHER TICKLER	DATE
VOUCHER NO.	AMOUNT	DRAWN IN FAVOR OF	CHECK NO.
		Size of form 4×6 inches Printed on white card	

Form 82. Voucher Tickler

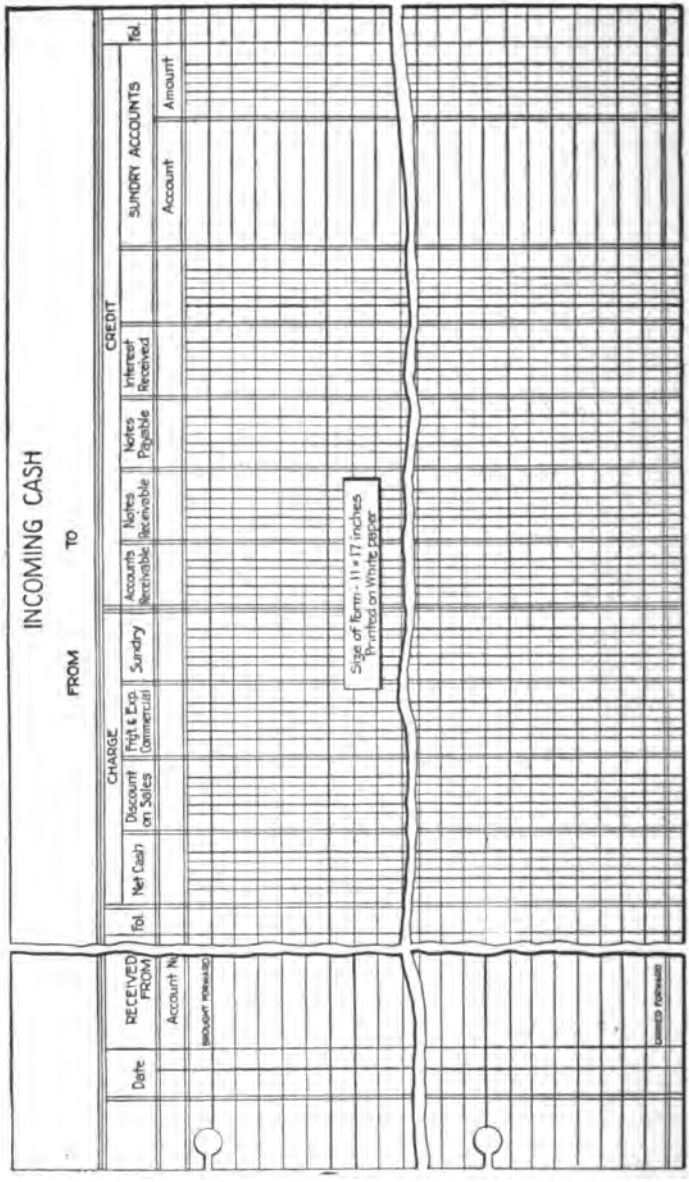




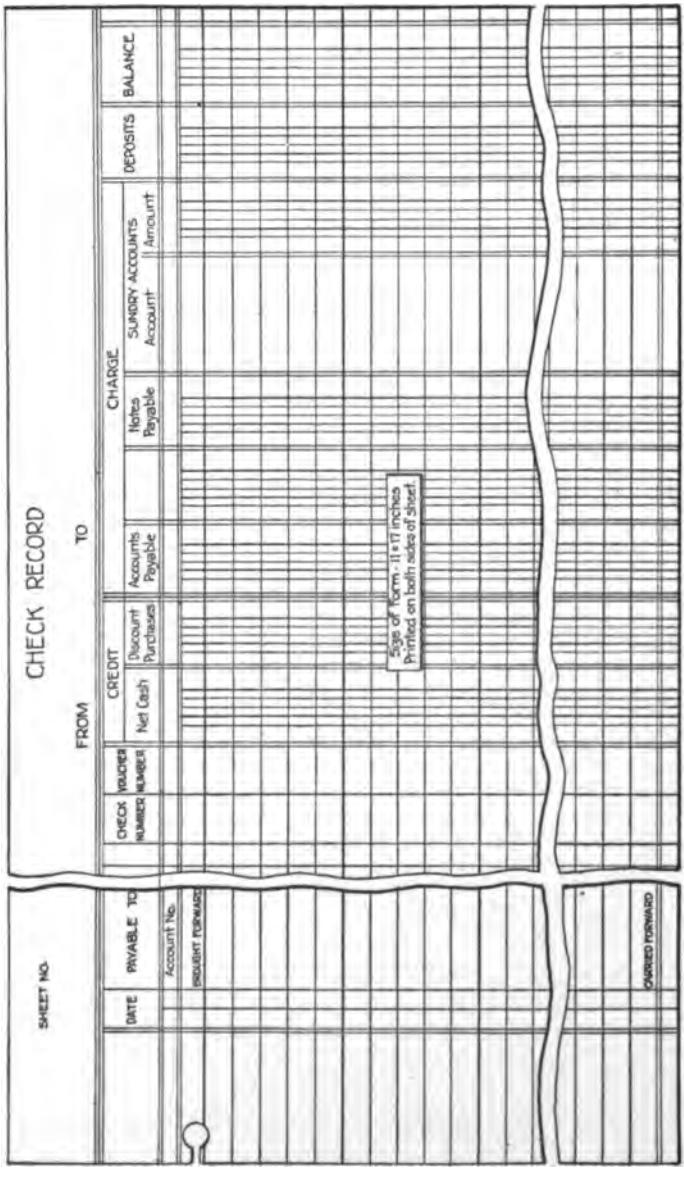
Form 83. Charge Voucher



Form 84. Voucher Record



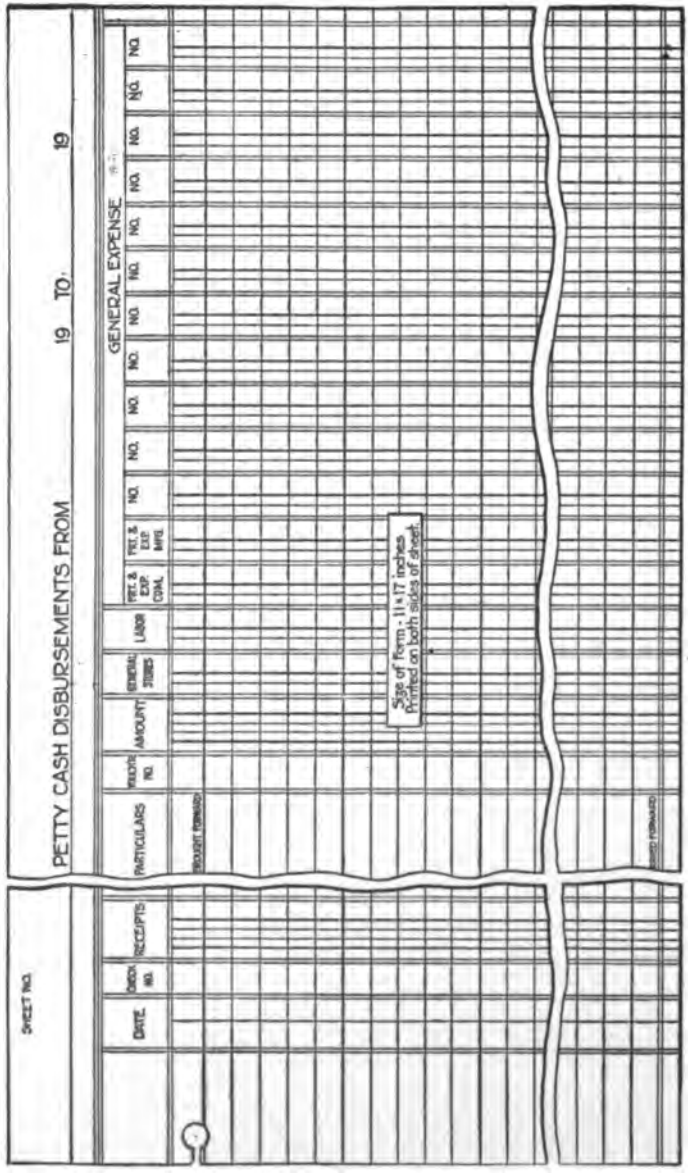
Form 85. Incoming Cash Sheet



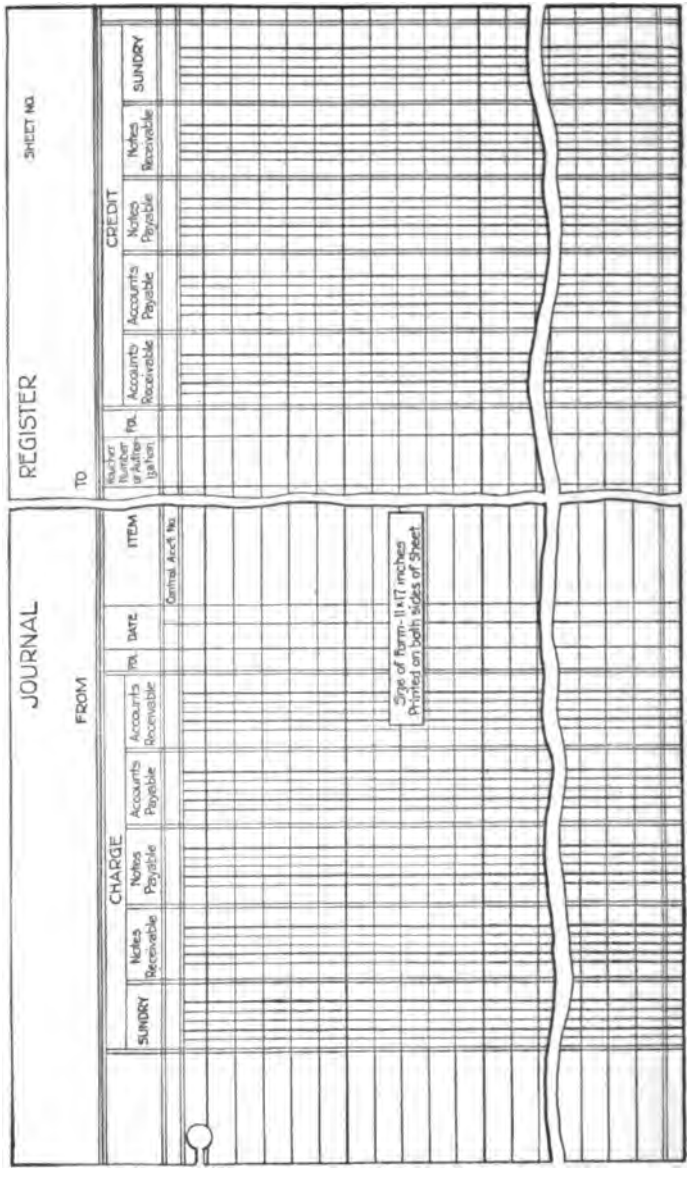
Form 86. Check Record

No. 0 Petty Cash Voucher Ledger Account Date		
Paid to	Amount	
On Account of		
" " "		
" " "		
" " "		
" " " Postage		
Signed Approved		

Form 87. Petty Cash Voucher



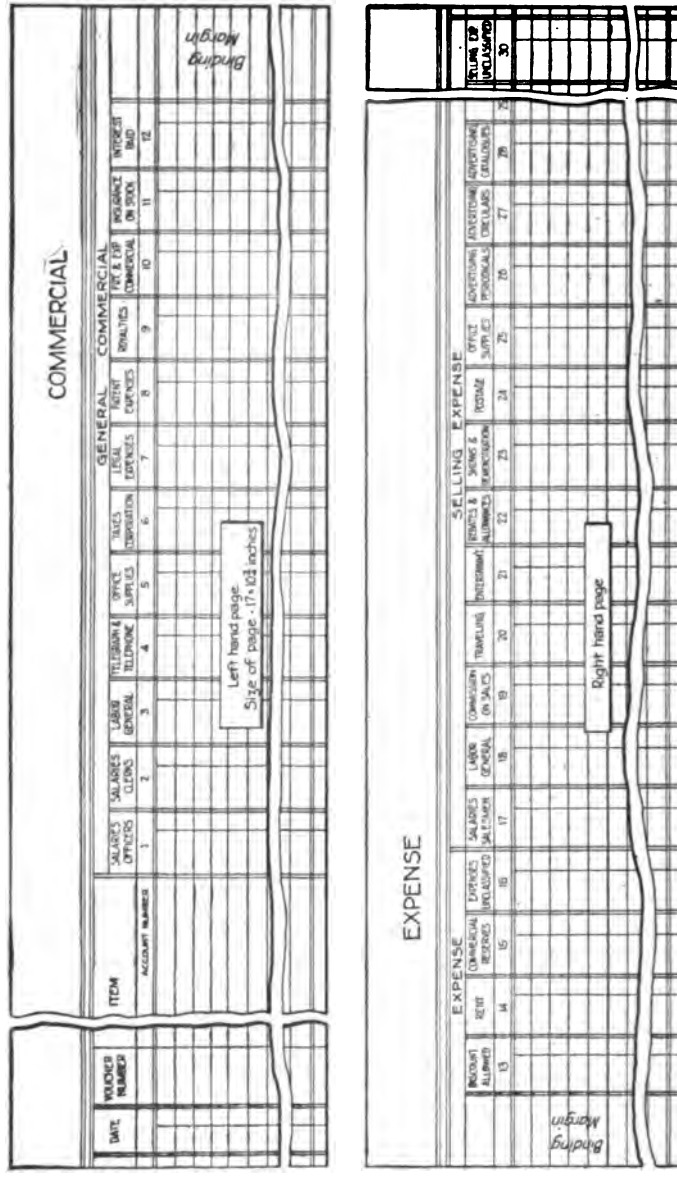
Form 88. Petty Cash Disbursements Sheet



Form 89. Journal Register

	JOURNAL VOUCHER DATE				J.V. No.
	AUTHORITY	ACCOUNT	LEDGER	DEBIT	CREDIT
		DEBIT CREDIT			
		Journal Folio Totals			

Form 90. Journal Voucher



Form 91. Commercial Expense Distribution Sheet

FORMS

CHART OF CONTROLLING ACCOUNTS

(Form referred to in Chapters XIV and XV)

CHART OF CONTROLLING ACCOUNTS

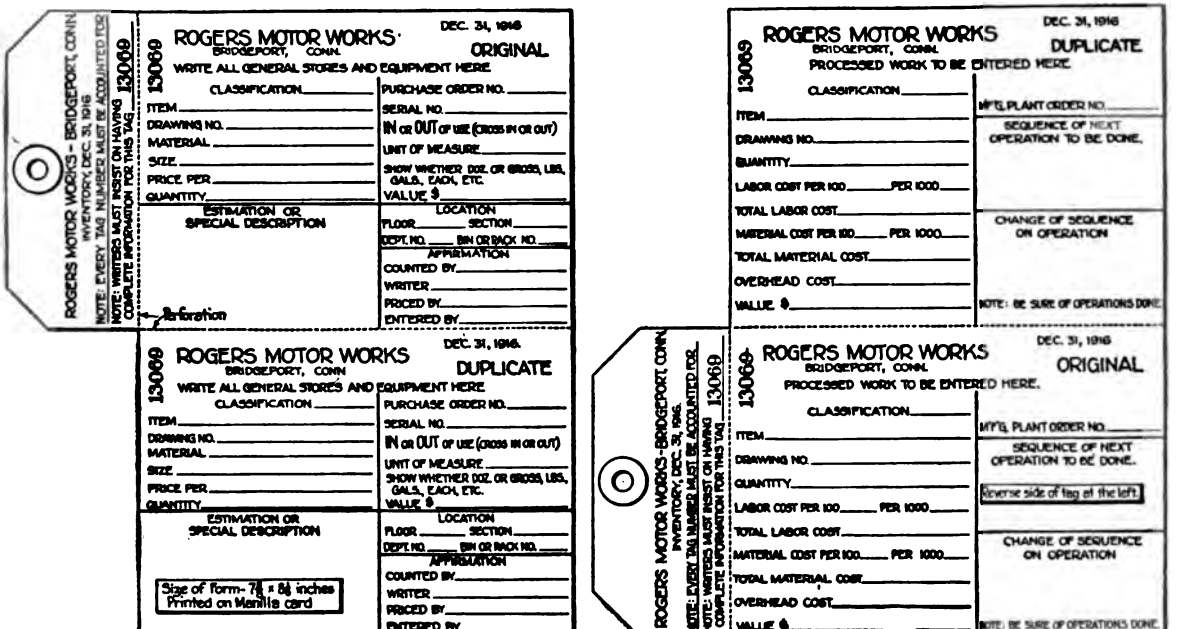
	ASSETS			LIABILITIES			PROFIT & LOSS				
	A CURRENT	B INVENTORY	C INVESTMENT	D CURRENT	E RESERVES	F CAPITAL, BONDS & MORTGAGES	G REVENUES	H COSTS	J EXPENSES	K PROFIT & LOSS	
1	Cash in Bank	General Stores	Real Estate	Accounts Payable	Real Estate	Capital Stock Preferred	Road Racer Model	Road Racer Model	Commercial Expense	Monthly Profit & Loss	1
2	Petty Cash	Work in Progress	Buildings		Buildings	Capital Stock Common	Roadster Model	Roadster Model	Overhead	Profit & Loss General	2
3	Accounts Receivable	Component Stores	Building Equipment	Notes Payable	Building Equipment	Bonds	Special Model	Special Model	Replacements & Guarantees		3
4	Accounts Rec. Past Due	Finished Stores	Office Furniture and Equipment	Taxes Accrued	Office Furniture and Equipment	Mortgages	Jobbing Model	Jobbing Model			4
5	Accounts Rec. Consigned	Finished Stores (Branches)	Machinery and Tools	Interest Accrued General	Machinery and Tools		Ladies Model	Ladies Model			5
6	Accounts Rec. Suspense	Shop Stores	Dies, Jigs & Fixtures	Interest Accrued on Bonds	Dies, Jigs & Fixtures		Juveniles Model	Juveniles Model			6
7	Notes Receivable		Shop Fixtures and Fittings	Interest Accrued on Mortgages	Shop Fixtures and Fittings		Racer Model	Racer Model			7
8	Advanced Exp. Insurance		Miscellaneous Equipment		Patterns		Motorcycle 4 H.P. Service	Motorcycle 4 H.P. Service			8
9	Advanced Exp. Advertising		Patterns		Drawings		Motorcycle 4 H.P. Tourist	Motorcycle 4 H.P. Tourist			9
10	Advanced Exp. Salesmen		Drawings		Patents		Motorcycle 6 H.P. Twin	Motorcycle 6 H.P. Twin			10
11	Treasury Bonds		Patents		Bad Accounts		Repairs	Repairs			11
12	Treasury Stock Preferred		Advanced Exp. Development & Experimental Work		Bond Redemption Fund		Component Stores	Component Stores			12
13	Treasury Stock Common				Obsolete Stock	Surplus	General Stores	General Stores			13
14	Labor				Obsolete Equipment	Dividends Declared	Unclassified	Unclassified			14

Form 92. Chart of Controlling Accounts

FORMS

INVENTORY RECORDS

(Forms referred to in Chapter XVI)



Form 93. Inventory Tag

EQUIPMENT RECORD

Description of Item _____ Inventory Tag No _____
_____ Manf'r's Serial No _____
Purchased From _____ Purchase Order No. _____
Made By _____ Date of Invoice _____ Date Rec'd. _____

Floor Space _____ Weight _____ lbs. Speed Chart No. _____ H.P. _____
Erection Date _____

LOCATION	INSTALLATION ORDER NO	DATE INSTALLED	FOR OPER.	M.L. PULLEY	SPEED OF M.L.	STANDARD EQUIPMENT

Size of form - 5 × 8 inches
Printed on White Card.

REMARKS: _____

PURCHASE COST						REPAIR COST			
Invoice Price _____						DATE	AMOUNT	DATE	AMOUNT
Freight Charges _____									
Installation _____									
Total Cost _____									
ADDITIONAL VALUES									
ORDER	DATE	COST	ORDER	DATE	COST				

Reverse side of above form

MANUFACTURING COST	Remarks:
Labor _____	
Material _____	
Overhead _____	
Installation _____	
Total _____	

Form 94. Equipment Record

Form 95

STORES LEDGER

With ready reference stores classification, indexed, tabulated, and containing a short description of the various classes.

Note: Nothing is more necessary in the revamping or systematizing of a business than a complete classification of general stores; to open up a "Stores Ledger" only partially classified means a continual annoyance, delay, and rearranging of ledger sheets to introduce new classifications from time to time. The usual stores classification, as given in Chapter IV, is simply indicative, leaving it for the stores recorder or stores keeper to work out the full classification to suit himself.

The stores ledger presented herewith gives a complete classification of stores for factories, alphabetically arranged and captioned. Each class is numbered with a Dewey decimal number and is ready for accounting and statistical work, and from this classification the manufacturer can select such names as fit his particular business and thus have his ledgers properly opened at the very start.

TABULATION SHOWING STORES CLASSIFICATION AND CLASS NUMBER

(Key number not shown here, is placed before the dash.)

–1.0 Abrasives	–2.0 Leather
–1.1 Books	–2.1 Lubricants
–1.2 Chemicals—Drugs	–2.2 Lumber
–1.3 Compounds	–2.3 Machinery
–1.4 Cordage	–2.4 Metals
–1.5 Equipment	–2.5 Paint
–1.6 Fabric	–2.6 Paper
–1.7 Fibre	–2.7 Stationery
–1.8 Fittings	–2.8 Tools—Hand, Small
–1.9 Fuel	–2.9

STORES CLASSIFICATION

–1.0

Abrasives

In this classification are to be included all cutting or grinding supplies and wheels used for this purpose.

Carborundum
  paper
  powder
  stone
  wheels
Crocus cloth
Emery
  cloth
  paper
  powder
  wheels
Garnet, paper
Glass, ground
Paper, sand
Pumice
  powder
  stone
Sand, sandblast
Soap, grit
Stone, sand
Wheels, grinding

-1.1

Books

In this classification are included all books of any kind, whether catalogues, periodicals, accounting or other books.

Accounting books
Atlases
Blank books
Copy books
Directories
Guide books
Memorandum books
Order books
Scrap books
Stenographers' books

-1.2

Chemicals—Drugs

In this classification are included all chemicals for laboratory and shop use, and also all drugs, instruments, etc., for the hospital.

Arnica, tincture
Aspirin
Bags, ice
Bandages
  gauze
  muslin
  roller
  rubber
Basins, dressing
Belladonna
Benzene, purified
Benzoin, tincture
Bismuth
Bottles
  acid
  magnesia
Brimstone
Calcium chloride
Calomel
Catgut ligature
Caustic
Chemicals—fire extinguisher
Chloral hydrate
Chloroform
Cocaine
Condensers, laboratory
Cotton
Cotton, absorbent
Creosote
Digitalis
Droppers
Ether
Ethyl morphine
Exterminator
Funnels, glass
Gauze,
  absorbent
  antiseptic
  Iodoform
Gloves, rubber
Graduates
Instruments
Iodide
Lime
Linaments
Needles, hyperdermic
Nitrate
Oils
  ammonia
  castor
  linseed
Ointments
Plaster, adhesive
Plungers, syringe
Potash
Saltpeter
Salts, soldering
Sheeting, rubber
Soda
Spatulas

–1.3

Compounds

In this classification are included all boiler, cement, washing, and other compounds (also the composition used for printing rollers), whether used in the shops or by the office.

Cement
- belt
- furnace
- high temperature
- liquid
- pipe covering
- Portland
- roofing
- rubber
- steam pipe
- water pipe

Cleaner
- boiler
- floor
- hand
- squeegee
- tube

Composition, roller

Compounds
- acid proof
- alkali proof
- flexible
- molasses
- polishing
- scouring
- welding

Gelatin, photo

Glue

Hectograph

Polish
- furniture
- metal
- stone, rotten

Soap
- compound
- scouring
- soft

–1.4

Cordage

In this classification are included all twines, cords and cordage, oakum, jute, waste, etc., etc.

Caulking
- jute
- oakum

Cord
- bell
- cotton
- flax
- flexible
- halyard
- hemp
- jute
- lacing
- marlin
- picture
- sash
- tarred
- window

Lacing
- cord
- twine

Oakum
- caulking
- navy
- picked

Rope
- cotton
- flax
- hemp
- manila

Twine
- broom
- cotton
- flax
- gray
- hemp
- jute
- lacing
- linen
- sail
- seine
- tag strings
- unoiled

Waste
- cotton
- wool

-1.5

Equipment—Factory, Office

In this classification are included all supplies and materials such as furniture and articles of daily use which are not tools or fittings.

Baseboards, typewriter
Baskets
  desk
  office
  rattan
  waste
Bedsteads
Bookcases
  revolving
  sectional
Bottles, water
Boxes
  storage
  transfer
Brushes, hair
Cabinets
  book
  file
  sample
  stationery
  steel
Cameras
Carts, push
Chairs
  bent wood
  revolving, cushion
  saddle seat
  step-ladder
  typewriter
Clocks (not time)
Containers
Cots
Cups
Cushions
  chair
  rubber
  typewriter
Cuspidors
Desks
  flat top
  flat (extra large)
  roll-top
  table
  typewriter
Dippers
Dusters
  feather
  wall
Files, document
Filters, water
Glasses
  drinking
  magnifying
  microscopic
Hangers
Holders, telephone
Ice
Ladders
Machines
  adding
  addressograph
  billing
  change making
  comptometer
  computing
  computing and typewriter
  duplicating
  envelope opening
  envelope closing
  eyelet
  mimeograph
  neostyle
  numbering
  paper fastening
  pencil sharpening
  perforating
  roller copying
  stamping (postage)
  typewriters
  watches, stop
Matches
Microscope
Racks
  hat
  towel
  umbrella
Rests, arm
Rollers
  chart
  map
  window-shade
Sweepers, carpet

-1.6

Fabric

In this classification are included all woven and other fabrics such as bagging, netting, canvas, rubber, leatherette, etc., etc.

Aprons
  laboratory
  rubber
  shop
  storm (auto)
Bagging
Bagging, jute
Bags
  burlap
  canvas
  coffee
  coin
  duck
Baskets, leatheroid
Bedspreads
Belting
  cotton
  round
Blankets
Bunting
Burlap
Carpet
Cloth
  awning
  copying
  scrub
  wiping
Counterpanes
Covers
  desk
  typewriter
Felt
Flags
Hose
  fabric
  rubber
Mats
  cocoa
  rubber
Matting
  cocoa
  rubber
Roofing
  paper
  rubberoid
Rubber
Sacks
Shades, window
Strips, weather
Towels, cloth

-1.7

Fibre

In this classification are included everything in the nature of fire-resisting materials and supplies, such as asbestos, steam packing, boiler packing, etc.

Asbestos
  fireboard
  insulating
  millboard
  paper
  pipe-covering
  sheet-packing
  tape
  wick-packing
  wood
  wool

–1.8

Fittings

In this classification are included all fittings, such as automobile, plumbing, steam, electrical; unions, couplings, nails, brads, pots, etc.; that is to say, anything and everything used in the plant which does not properly come under tools or equipment.

Annunciators
Arrestors, lightning
Basins, wash
Baskets, toting
Bells
Blades, fan
Bolts
  expansion
  machine
  track
Bone, black
Bowls
  closet
  urinal
Boxes
  conduit
  tote
Braces
Brackets
Brick, fire
Buckets
  fire
  galvanized
  paint
Bulbs
  atomizer
  electric
  horn
Burners
  gas
  incandescent
Burnishers, metal
Bushings
  Babbitt
  brass
  bronze
  composition
  porcelain
  steel
Buttons
  door
  push
Cable
  electric
  elevator
  iron
  steel
Cans
  ash
  garbage
  G I
  oil
  paint
  sprinkling
  steel
  tin
Carbon
  electric
  filament
Card holders
  brass
  iron
Catches
Centers, push button
Chains
  jack
  sash
  transom
  weight
Checks, door
Clamps
  basin
  beaker
  beam
  bolt
  cabinet
  condenser
  iron
  laboratory
  pinchcock
  steel
  wood
Clay, fire
Clips, shade roller
Clusters, electric
Coils
  fan
  resistance
Condensers
  glass
  metal
Conduit
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  funnels
  gauze
  gutter
  rivets
  rods

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broom
chest
chisel
drawer
file
fork
hammer
hatchet
hoe
mop
pick
rake
scoop
shovel
sledge
socket
spade
tub
Hangers
door
pipe
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- pendent
- railroad
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- wiring

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Tweezers
Type, printing
Unions
Valves
- air
- flushing
- pump
- radiator
- steam
- water

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- copper
- iron
- lead
- steel

Wax
Weights
- sash
- scale

Wheels, pipe cutter
Wire
- annunciator
- black
- copper
- iron
- steel
- telephone

Wringers, mop

-1.9

Fuel

In this classification are included any and every material, substance or liquid used to feed a flame for the purpose of producing steam, heat, or light.

Benzine
Candles
Charcoal
Coal
- anthracite
- bituminous

Coke
Gasoline
Naphtha
Oils
Paraffine
Wood

–2.0

Leather

In this classification are included leather belting, lacing, hides, chamois, fur robes, or fur-lined coats, such as those worn by chauffeurs.

Bags
  document
  hand
  money
Belting
Chamois
Coats, fur, chauffeurs'
Gaskets
Hides
Laces
Lacing
Rawhide
Robes, fur, automobile
Straps, gun
Washers

–2.1

Lubricants

In this classification are included all oils, greases or substances of any kind used for lubricating machinery.

Graphite
Grease
  auto
  axle
  cup
  graphite
Oil
  auto
  cylinder
  engine
  Havoline
  machine
Tallow
Vaseline

–2.2

Lumber

In this classification are included all wood of any description, whether in the rough or dressed state, and also boxes used for packing.

Arms, cross
Ash
Backing
Basswood
Boxes, packing
Capping
Cedar
Chestnut
Cypress
Flooring
Gum
Hemlock
Hickory
Maple
Millwork
Moulding
Oak
Paling
Pine
Poles
Poplar
Posts
Scantling
Shelving
Siding
Slats
Spruce
Stepping
Strips, weather
Walnut

-2.3

Machinery

In this classification are included all machines and machinery erected in the shops (including time clocks) such as burring, broaching, chambering and milling machines.

Arrester, dust
Assembling, grip
Automobiles
  delivery, light
  touring
  truck, electric
Backing-off
Balancing-knife
Barrel bedding
Beading
Belt
  benches
  scarfing
  lacing
Benches, saw
Boring
  saber handle
  spindle
  vertical
Brakefolder
Broaching
Burring
Calibrating
Centering, gun stock
Chambering, barrel
Coilers
Compressors
Cutters, bolt
Cutting-off
Dental engines
Dies sinkers
Drilling, hand guard
Drills
  automatic
  barrel
  high speed
  horizontal
  sensitive
  upright
  vertical
Driving, bolt nut
Engraving
Exhaust fan
Exhauster
Fans
  double
  single
Filing
Folding
Forming
Gaging
Grinders
  automatic
  barrel drill
  form cutter
  hemming
  open side
  plain
  precision
  rivet
  special
  tool
  vertical
  wet tool
Grooving, graining
Hammers
  drop
  cushion
  steam
  strap
Heading
  single stroke
  double stroke
  upsetting
Joining
Jointing, saber handle
Key seater
Lathes
  barrel turning
  bench
  cone head
  engine
  double
  geared
  quick-change
  single
  speed
  tool makers
  turret
  variety
  wood
Marking
Mill
  boring
  charcoal
  turning
  vertical
Millers
  adjustable
  automatic
  bench
  cam
  external thread
  hand
  internal thread
  plain
  semi-automatic
  universal

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vertical
Nut Screwing
Planers, 4 roll
Planing, jointing
Polishers, automatic
Polishing
frames
heads
Presses
arbor
bench
embossing
hydraulic
knuckle
hot trimming
pillar
plain
power
punch
reducing
special
Profilers
automatic
horizontal
spindle
wood
Punching
Reamers
Rifling
Riveting
rotary
spindle
vertical
vibrating
Rolling
Sand-blast
barrels
cabinets
machines
traps
Sawing
band
rip
scroll
wood
Saws
equalizing
facing
hack
high speed
hot
wood-trimming
Screw machines
automatic
automatic cut-off
automatic turret
hand
plain
slotters
wire feed
Separators
oil
sterling
turbine
waste
Shapers
crank
horizontal
universal
vertical
wood
Shaping
butt
crank
vertical
Shavers, bench
Shaving
Shears
alligator
angle
bar
bench
combination
lever
power
special
squaring
Slotting
automatic
die
hand
Splinters, receiver
Spotting
Spring
setting
winding
Stake holders
Stamping
Straighteners
Striking
Swagging, hot
Tapping
multiple spindle
vertical
Tenoner, standard
Testing, vertical
Thread, rolling
Tilting
Turning, wood
Welding
acetylene
automatic
electric
spor
Wheel washing
Wiring, turning

-2.4

Metals

In this classification are included all bar, cast, sheet and pig metals of any kind whatsoever which are not actually made up into definitely named articles.

Aluminum
  bar
  sheet
Babbitt, bar
Brass
  bar
  sheet
Bronze
  bar
  block
Iron
  bar
  cast
  pig
  sheet
Lead
  bar
  cake
  pig
  sheet
Magnolia
Manganese
Sheathing
Sheeting
Solder
Spelter
Steel
  component
  high speed
  high speed tool
  machine steel
Tin
  block
  pig
  sheet
Zinc
  bar
  sheet

-2.5

Paint

In this classification are included all paints, varnishes, shellac, rosin, tar and other supplies of like nature.

Drier
  japan
  paint
Dry
Enamel
Filler
Finish, wall
Gum, veneering
Japan
Lampblack
Lead
  sugar
  white
  red
Lime
Mixed
Pitch
Plaster of Paris
Preservative
Putty
Resin
Rosin
Shellac
Stain
Tar
Turpentine
Whitewash

–2.6

Paper

In this classification are included all bulk paper, cardboard, made up pasteboard boxes, etc., etc.

Bags
  mailing
  mails
Board
  beaver
  binders
  bristol
  illustrating
  oil
  press
  straw
  tag
Boxes
  cardboard
  pasteboard
Cardboard
  colored
  manila
  white
Paper
  wrapping
  writing (in bulk, uncut)

–2.7

Stationery

In this classification are included all cut paper, letter-heads, envelopes, forms (printed and blank), pens, pencils, etc.

Bands, rubber
Binding devices
  loose-leaf
  passe-partout
Brushes
  artists'
  copy
  draftsmen's
mucilage
  paste
Calendars
  desk
  wall
Cards
  guide
  index
  manila
  pressboard
Chalk
  crayons
  French
  prepared
Charcoal, artists'
Clips
  board
  brass
  paper
  spring
  steel
  photo
Compasses
  beam
  pen
  pencil
Cups, paint
Cushions, pin
Cutters, paper
Edges, straight
Envelopes
Eradicator
Erasers
  rubber
  steel
Films, pack
Folders, paper
Frames
  label
  map
  printing
Glasses, drinking
Gum arabic
Ink
  colored
  copying
  drawing
  duplicating
  fountain pen
  indelible
  marking
  numbering machine
  stamp pad
  stencil
Inkstands

Instruments, drawing
Knives
  office
  pencil sharpening
Labels, gummed
Magnets
Mallets
Mucilage
Pads
  chair
  desk
  numbering machine
  stamp
  typewriter
Paper
  backing
  billing machine
  binding
  black print
  blue print
  bond
  bromide
  carbon
  computing machine
  detail drawing
  detail manila
  developing
  drawing
  filter
  fly
  gummed
  impression
  India
  ledger
  machine finish
  manila
  map
  note
  off-set
  onion skin
  paraffine
  photostate
  photographic
  platinum
  process
  sketching
  stencil
  tissue
  typewriter
Paste
Pencils
  artists'
  automatic
  camel's hair
  carpenter
  colored
  lead
  slate
Pens
  bow
  drafting
  fountain
  lettering
  ruling
  steel
  stylographic
  swivel curve
Pins
Plates
  photographic
  printing
Pounces
Racks
  pen
  stamp
Ribbons
  adding machine
  computing machine
  dating stamp
  duplicating machine
  typewriter
Rulers
  drawing
  parallel
  patent
  slide
Scales
  automatic
  coin
  drafting
  letter
Scissors
Silk, oiled
Sponges
Tabs, index
Tacks
  push
  thumb
Tags
  key
  merchandise
  shipping
Tank, developing
Tape
  adhesive
  gummed
  linen
Thermometers
Trays, photo
Triangles
Wax, sealing

–2.8

Tools—Small and Hand

In this classification are included all small and hand tools of any kind whatsoever.

Adzes
Anvils
Augers
Awls
  book-makers'
  ice
Axes
Bellows
Bevels
Bits
  auger
  expansion
  plane
  screw driver
  twist drill
Blades
  awl
  saw
Braces
  corner
  ratchet
Brushes
  cleaning
  dusting
  kalsomine
  machinists'
  marking
  paint
  radiator
  sash tool
  scrub
  stencil
  stipplers
  toilet
  varnish
  whitewash
Calipers
Caulks
Chisels
  cold
  hot
Clamps
Combs, graining
Countersinks
  metal
  wood
Couplings
Cups
  force
  plumber
Cutters
  glass
  pipe
Dies
  pipe cutter
  stamp
  stencil
  stock
Dividers
  bow
  hair-spring
  proportional
Drills
  auto boring
  breast
  carbon steel
  hand
  high speed
  metal
  miller's
  machine
  Stanley's
  shank
  star
  taper
  twist
  wood, taper
  wood, square
Files
  bastard
  flat
  one-half round
  rasp
  round
  triangular
Gages
Hammers
  blacksmith
  bookbinder's
  bricklayer's
  claw
  engineer's
  machinist's
  planishing
  riveting
  sledge
  tack
  tinner's
  upholstery
Hones
  oil
  water
Instruments, precision gages, etc.
Irons, soldering
Jacks
  hydraulic
  lifting
  wheels
Knives
  drawing
  hacking
  putty
  shoemaker's
Levels
  carpenter's
  hand
Mattocks
Microscopes
Mops
Mortars
  glass
  porcelain
Moulds
Mowers, lawn
Oilers
  brass
  copper
  iron
Picks
  concrete
  railroad

Pincers
Planes
Plungers, screwdriver
Points, glazier's
Pumps
  force
  section
  suction
Reamers, hand
Saws
  circular
  coping
  crosscut
  hack
  hand
  rip
Scrapers
  paint
  wood
Shears
  grass
  hedge
  tinner's
  trimmer's
Shovels
  D handle
  L handle
  post-hole
  S handle
  scoop
  snow
Spades
  D handle
  L handle
  S handle
Spatulas
Squares
  carpenter's
  machinist's
Swedges
Tampers
  concrete
  railroad
Tongs
  blacksmith's
  chain
  ice
Trowels
  brick
  cement
  circle
  corner
  garden
  plastering
  pointing
Vises
  chain
  hand
  machinist's
  saw
Wrenches
  hand
  monkey
  stillson
  tap

–2.9

This number section provides for a possible future subdivision of one of the now existing classes should it be deemed necessary.

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